

Glenn E. Cahn, PhD PLLC
3205 Randall Parkway, #112
Wilmington, NC 28403
910 332 4134

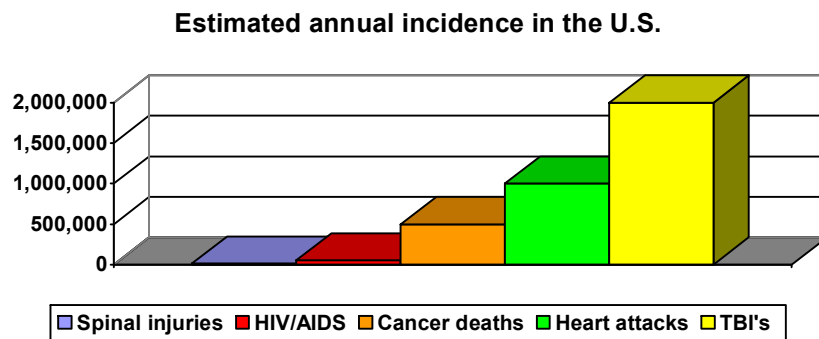
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Traumatic Brain Injuries

“No head injury is too severe to despair of, nor too trivial to ignore.”

--Hippocrates

Traumatic brain injuries (TBI's, also often referred to as a head injury, or HI) have been called 'the silent epidemic' in the U.S. Estimates vary as to how many occur in this country every year, but most suggest somewhere around 1-2 million. The majority of those that occur are milder in degree. But, as the quote above suggests, minor head injuries may be a contradiction in terms. That is, damage to the brain is never good.



The ratio of male/female ratio of TBI's is generally estimated as being somewhere between 2:1 and 3:1. The risk of TBI is greatest in the 15-25 year old age group. Motor vehicle accidents (MVA's) are the #1 source of brain injury in the U.S., accounting for roughly 50% of all such injuries. Falls of various types cause about 25% of all TBI's. Sports-related TBI's are nominally a small percentage – but the unknown issue is how many are never diagnosed.

Some Basics

TBI's can be classified in a variety of ways. One is whether they are 'open' (OHI) or 'closed' (CHI). Open head injuries are easy to explain – the skull has been cracked, penetrated, or otherwise physically broken. They can occur from blows such as a person's head hitting a windshield, or something striking the head like a baseball bat. Bullet wounds to the skull are another obvious example of an open head injury.

Closed head injuries are the opposite – there has been no cracking or penetration through the skull. These too can arise from a variety of means. Motor vehicle accidents (MVA's) are the primary means for both open and closed head injuries to occur. Other means to sustain a closed head injury may not involve 'trauma' per se – such as from drowning, or other forms of oxygen

deprivation (e.g. carbon monoxide poisoning, heart attacks). Falls (such as down stairs, off a ladder, or a bike), and assaults/fights are other common means to a closed head injury.

All things being equal, CHI's result in more brain damage than open head injuries. This may seem paradoxical. But, the reason for this is that if the skull fractures it is absorbing some amount of energy and so less is received by the brain itself. If the skull remains intact, all of the energy from the traumatic blow is transferred inside to the brain where it can cause more damage. The simple way to understand this is that in a car accident it is better for a vehicle to crumple up – and absorb some of the energy – than for it to be too rigid and have that force transferred to inside the passenger compartment. This is why modern vehicle design involves 'crumple zones' so that the metal takes the brunt of the force and not the passengers.

A second means to classify TBI's is by their severity. The four most common labels used are minimal, mild, moderate and severe. The terms may be easy to understand on an abstract level, but are far harder to apply on a personal level.

The best way to understand what these terms mean is to start with the ones which are easy to agree on: 'minimal' and 'severe.' Minimal brain injuries are what I call 'little dinks.' They can occur in any number of ways, like someone working under the kitchen sink on the plumbing. When they move to get up their head bangs in to the cabinet. A small percentage of people who bang their head in such a manner may 'see stars' or get a little headache for a few seconds. Other types of little dinks may include people who fall down or on to something, and get a temporary 'goose egg' on their forehead in terms of some edema forming under the skin.

Such minimal blows to the head may be transmitting some force to the brain, but in my experience the probability of permanent brain damage having occurred is between little and none.

Severe brain injuries are also easy to recognize. Anything that puts a person in to a coma for some amount of time would be an obvious example. Or, anything that suddenly transforms a person's life and puts them in to a permanently disabled state, such as no longer being able to walk or talk, is almost undoubtedly going to be a severe brain injury.

That leaves 'mild' and 'moderate' to define and recognize. Various professionals and organizations have come up with different definitions for mild TBI's. I do not like any of them because of their having too many inherent flaws. For instance, most require that a concussion be diagnosed and that it not last beyond a certain number of minutes. The flaw in this part of such a definition is that many people never receive medical attention at all. Or, they go to a doctor or hospital and the treating physician misses the presence of a concussion even though one has occurred.

Consequently, the way I conceive of 'mild' TBI's is different. And that is if a person's ability to function normally is adversely affected by such a blow, and they return to (near) normal ability within about three months. Examples can include someone having temporary headaches that have resulted from a TBI and which interfere with their daily living, such as handling school or work functions. Or, they may have some problems with finding the right word when they talk

for a week or two. Or, their short term memory is not as sharp for awhile. Personality changes, such as being more depressed, withdrawn, or irritable can occur for awhile.

Another way I think of 'mild' TBI's is that they are most likely the brain injured people who never know they have suffered damage. This is the group of people that I see most frequently, and their numbers are very large. More on this in a moment.

What is a 'moderate' TBI? Not mild, and not severe.

Again, formal professional definitions do exist for a moderate brain injury, but I have not found them any more practical than the ones for 'mild.' Offering such a classification scheme for a brain injury is murky. It can be likened to trying to classify different shades of gray: light, medium-light, medium, medium dark... Where does one end and the next begin? Try and get a group of people to agree. This is the problem with trying to classify 'mild' or 'moderate' or 'mild-to-moderate' TBI's. Rather than obsessing over the exact label that is applied, I am more concerned about what the effects are on a person and their ability to live their life in an effective manner.

Looking for TBI's

Given my orientation, of caring less about the label of what degree injury may have occurred, and focusing more on the effects and what might be done to treat them, I first have to determine if any TBI's have occurred. In obtaining background information during a neuropsychological assessment I ask a number of questions to see if the person may have received a TBI over the years, whether they know it or not. Such questions include:

- ❖ Have you ever been in a car accident?
- ❖ Have you been 'dinged' ('had your bell rung') while playing sports?
- ❖ Fallen off a bike, ladder, out of a tree, etc?
- ❖ Fallen down stairs?
- ❖ Been in physical fights?
- ❖ 'Seen stars' from having something hit you in the head?

The problem with such questions is trying to determine the seriousness of such an injury. For instance, many people report being in fender benders, and minimize and downplay the car accident. Was it a minor collision? I was not there, and so it is very difficult for me to determine the seriousness of it. How much speed was involved? Was the person wearing a seat belt? Did they have headaches, nausea, vomiting afterward? For how long? Were they dazed or woozy, and if so how long did it last? These types of questions lead once again to trying to classify the shades of gray, and so certainty is difficult to come by.

One way I try to better determine what might have happened to a person – and if brain injury has occurred - is by focusing not on the incident ('It was a fender bender') but instead the number of these types of blows over the person's life time. The way I count brain injuries is: "one, two, three, too many to keep track of."

Why such a counting system? The common wisdom is that having a single TBI doubles the risk of having a second. If two have occurred, the risk of a third happening is eight times greater than normal. If three occur, in my experience the risk of having ‘more than three’ is unknown but very large. That is, head injury occurrences spin out of control, in a downward spiral. People with more than three will typically tell me that they know they have had several, but have long since forgotten the details of most if not all of them. With my pushing and prodding for them to remember such incidents, they may recall a couple of car accidents, and falls, and blows from sports, etc. But, the details remain murky, and I almost never get much in the way of specifics.

The inherent flaw of trying to figure out the number of TBI’s a person has had as being ‘one, two, three, or too many to keep track of’ is the same as classifying their severity. ‘None’ and ‘too many’ are *fairly easy* to identify. I hedge here because many people forget what has happened to them over the years, especially as they become older. Others do not know, such as a baby accidentally being dropped by an older sibling, and the parents never being informed because the child is embarrassed. The middle two classifications (1 or 2 TBI’s) are far murkier, such as trying to determine if a car accident at 25 MPH, classified as a fender bender by the person, did anything to permanently harm a person.

Another way I have of trying to determine if a brain injury has occurred is to look at its effects. e.g. Adults will tell me that they were hit by a car as a pedestrian back in 1st grade. That sounds serious. But, I will follow-up and ask ‘What kind of grades did you earn in school in subsequent years?’ Often I have heard that they made straight-A’s, or otherwise done very well. That is not absolute proof that the accident caused no TBI, but it is fairly good evidence.

The flip side of this scenario is someone who suffered a blow to the head, and they never again functioned well. In the more extreme cases, typically involving a moderate or severe TBI, the person will realize immediately, such as within a day or less, that their functioning has become impaired. They are suddenly depressed whereas they used to be happy. They are no longer able to work, and never return to employment again. Milder TBI’s typically see the person not realize the effects of the blow for weeks or months, and occasionally even years. Such individuals will return to work after a TBI such as from a car accident, but they are less capable of doing it than before. They get fired for the first time in their life. Or, they are more tired before the end of a day. They need assistance from others in ways they never did prior to the TBI.

Most people I have worked with professionally fall somewhere in the mild or moderate category of TBI’s. Estimates are that about 75% of TBI’s in the U.S. are mild in degree. But, remember my dislike for the professional definitions of ‘mild’? So, take such numbers as being more murky than they may sound, and simply understand that milder TBI’s out number more severe ones by a good amount.

The effects of TBI’s

Many people with TBI’s that I have seen over the years, including those with ‘mild’ damage, do not return to a fully normal function, ever. What areas of functioning are most commonly affected?

Personality changes are very common, and they can take a serious toll on quality of life. The most common effects that I see, such as depression, irritability, or anger, never fully disappear. Or, the person is not as capable in leading their daily life, such as having become scatter brained, disorganized, or forgetful. Many people pull back from social involvement. They find it is too hard to reach out to friends and relatives, and they no longer have the tolerance for dealing with crowds of people such as at a party or family gathering. Instead, they keep to themselves, do not make or return phone calls like they used to, and drastically reduce social outings such as going to movies or eating out.

Spouses – usually wives – often tell me they have another child to raise now. That is, there are so many emotional and behavioral problems resulting from the brain injury, that the person has become child-like, such as being very dependent and no longer fully capable of functioning in an adult manner. Divorce rates are elevated in families where one spouse is brain injured.

Still other effects of personality change from brain injury include the person being more disinhibited. Personality regulation can be thought of as involving a ‘gas pedal’ and ‘brake’. That is, there is a time to be energetic and excited, and a time to be quiet and very controlled. There is a balance between the excitatory and inhibitory, and where that balance is shifts with the moment and situation. Being a ‘stick in the mud’ at a New Year’s eve party is not good. Being rambunctious, boisterous or talking loudly while sitting in a religious sanctuary attending services on the Sabbath is equally inappropriate. What is important to understand is that the capacity to regulate and moderate such emotional display is frequently lost when TBI’s occur.

When a person is brain injured and disinhibited they are like what I call ‘the little kid who screams in the grocery store.’ The child wants something, such as candy seen in the check out line, and when the parent says ‘no’ the kid has an outburst. Other adults nearby will see and hear this, and realize it is just normal behavior in a child. Kids can get away with such fits, adults can not. If an older individual, including even a teen, who has suffered a TBI engages in such inappropriate displays of behavior, adverse consequences are highly likely. Students are suspended from school. Adults are fired. Police come and warn if not arrest offending individuals.

Why are there such societal intolerances from being disinhibited? With the more serious cases, what I see is too much irritability, anger, aggression or otherwise inability to get along with other people. Yelling, arguing, fighting, brandishing of weapons, or otherwise showing poor judgment (such as ‘talking back’ to a police officer who stops someone for a traffic violation) occurs. Parents who are brain injured have little if any tolerance for their children’s normal behavior (such as incessantly asking ‘But why?’, or sibling rivalry arguments). Employees question, challenge, or otherwise do not get along with their bosses. Verbal fights or silent dissension (disagreeing, but never having the energy or ability to resolve the argument and so it festers far too much) within marriages also is common. The cooperative nature and needed tolerance for each other that relationships require is lost.

Two effects that I see very commonly but are often overlooked, or are largely unrecognized, by society is that the brain injured person needs external controls imposed on them. In simpler terms, they end up in psychiatric hospitals and/or prison. e.g. It has been said that the most

populated ‘psychiatric facility’ in the U.S. is the Los Angeles County jail. That too has been my experience: nearly 100% of prisoners that I have worked with in local jails and state prisons have suffered significant brain injury. Similarly, patients in psychiatric hospitals have a high rate of brain injury. One national estimate is that roughly 50% of psychiatric in-patients are brain injured. At some of the hospitals I have worked the number of brain injured patients in my experience has been close to 100%.

Why are so many psychiatric patients and inmates brain injured? They can no longer cope effectively. Or, they can not adequately regulate their behavior in ways that they need, or society requires. Depression becomes more severe. Impulsive acts, such as assaults, arise. Recklessness, such as repeatedly driving at very excessive speeds, happens. Substance abuse with alcohol and/or drugs, perhaps in an attempt to self-medicate their anger/depression/irritability, becomes worse. Such substance abuse then leads to an increased rate of other types of unacceptable behavior. I should state that such individuals are typically not impacted by ‘severe’ brain injuries. Rather, they most likely are in the ‘mild’ category as defined by other professionals as I mentioned earlier, but not necessarily by me.

Other common effects of brain injury involve cognitive skills. Short term memory in particular is quite fragile. Most everyone as they become older can make humorous quips about being forgetful and more absent minded. But the forgetfulness that stems from brain injury is worse, and can not be easily written off to normal aging.

Other cognitive effects of TBI often include decreased ability to pay attention and focus. The person’s mind will wander, like those people who have attention deficit disorder. Complaints may include not being able to pay attention in meetings. They may sit silently while others are talking at the meeting and the information they later need for their job is not being absorbed. Or, they are making a presentation and not making sense, such as drifting or jumping around too much in their comments.

‘Executive skills’ are a critical component of cognitive functioning, and they are often hard hit by a TBI. These skills include the ability to:

- ❖ think and conceptualize an idea
- ❖ organize and plan
- ❖ initiate and persist at something as is needed
- ❖ be able to monitor for mistakes, and then catch and correct them in a timely manner
- ❖ being able to stop when appropriate
- ❖ moderate emotions as needed, such as balancing the ‘brake’ and ‘gas’ of personality as required in varying situations

The absence of executive skills can easily be seen by looking at little kids. Parents have to tell them, every night, ‘Go brush your teeth... Now get in to your pajamas... Now bring me a bedtime book you want me to read...’ Adults in contrast have to be able to do such skills on their own. They need to be able to ‘juggle multiple balls in the air.’ Running their own life, being a spouse and parent, having a job and doing it effectively, all require effective executive functioning.

What happens when executive skills are lost? I already have mentioned disinhibition. Other forms of executive deficit from TBI's include insufficient organization and planning. Problems here may include not having the capacity to attend to the many details of daily life, at home, work or school. The brain injured 'drop the ball' and forget to do something important. Or, they are unable to figure out the necessary steps of what to do and how to go about bringing it about. This may involve important facets of life such as the strategy to find a new job or place to live. The brain injured individual will talk about 'I have to get a job' or 'I need to find a new apartment' but never get around to doing the actual work because of too little organization and focus.

Still others may know what they have to do, and have an organizational strategy in hand – but never get around to actually 'getting in to gear' and doing it. Others may see them as being 'lazy' but in reality it is not from lack of desire that they are unable to initiate needed action. Rather, it stems from what is now missing in their brain's functional abilities.

Yet another problem that can arise with TBI's is someone who knows what to do, how to go about it, and begins the process that will get them where they need to go. But they still fail. These individuals have lost the ability to look for, catch and correct mistakes in a timely manner. One analogy I use to describe such folks is that they are like the car driver who is making great time while driving fast on a highway – but they are going in the wrong direction and never realize it. Another analogy I frequently use is the football player who carries the ball down the field to score a touch down – but goes to the opposing team's goal post. Some will realize their mistake after the fact, and may be able to 'run the ball back up the field' again. Others catch their mistake too late, and are unable to get back on track. Or, they never catch the error at all.

Being able to stop doing something when appropriate is perhaps best appreciated by little kids who can engage in certain behaviors incessantly and upset their parents in the process.

- ❖ "But why?" questions asked ad nauseum.
- ❖ Constantly interrupting a parent who is talking on the phone.
- ❖ 'The screaming child in the grocery store' that keeps on having such a fit long past any comfortable point for the parent.

are all examples of not being able to turn off behavior when such cessation is needed. Again, kids can get away with such inappropriate behavior for the most part. Adults can not. Society, be it employers, spouses, family or friends are far more intolerant of such grossly inappropriate behavior. In the more extreme cases, psychiatric hospitalization or imprisonment can result.

Recovery from & treatment of TBI's

The rule of thumb is that for adults who have suffered a TBI the vast majority of neurological recovery that will ever happen occurs in the first six months. Some professionals will say that neurological recovery continues out to 12 months, and some even suggest 24 months. I have done so myself – but I have yet to see in my practice of the past twenty-five years any significant recovery after six months. Various behavioral strategies – such as using written reminders to

compensate for a weaker memory - can be employed beyond the six month point of a TBI, and may be helpful to some extent.

Kids are different. How long they may recover on a neurological level is not as clear, and estimates are often put in the 3-5 year range after a TBI has occurred. How is 'kid' defined relative to age? That is another murky issue.

It is often cited that kids' brains are more 'plastic' meaning that they are more adaptive to traumatic insults, and they do better than adults who suffer such injuries relative to regaining lost skills. There is some truth to this assertion, but only partially.

Individuals who are 'younger' do better than those who are 'older' in recovering from a TBI, all things being equal. How are these terms defined? Many will use the age of 40 years as the dividing line, although I also have seen age 30 as the cut point.

As to children, adolescents or teens doing better than those who are considered adult – there is good news/bad news. The good news is that kids in such age ranges do have more plastic brains. Their brains have not been hard wired as much as adults' brains. This might be likened to the well-publicized issue of stem cells that can be grown in to any type of cell in contrast to other cells, such as one for the heart or liver that is already formed and can never function in anything but that one role. I will not say that brain cells of kids have all the capacity of a stem cell, but they are *relatively* more flexible compared to an adult's.

The bad news is that kids brains are still developing when they suffer a TBI. The brain for the typical person is not fully developed neurologically until roughly the age of 25 years on average. For adults who suffer a TBI, they generally have learned most if not all of the important foundation skills they need in life. e.g. They can dress themselves, multiply numbers, drive a car, follow a recipe. Language such as vocabulary, speech and writing are well developed. Motor skills like walking are fully formed. These abilities are 'burned' in to the brain and are very hard to disrupt or destroy. It is possible to lose them, and probably every adult has heard stories of someone who was in a bad car accident, or had a stroke, and had to relearn how to walk or talk again, and that such efforts required months of time.

Kids, depending on their age when a TBI occurs, have learned little if any of such foundation skills. The TBI effectively throws a monkey wrench in to the learning process and makes it far more difficult to acquire such ability. That is, their knowledge is not burned in to their brains yet, and as such it is far easier to interfere with its acquisition and storage.

Ultimately, the issue of kids brains being more plastic misses the point. Brain damage is never good to sustain. It never improves the quality of a person's life, or makes the individual more functional and skilled. It may make a person far more appreciative of life and good health, after the fact, by way of realizing how much they unfortunately took for granted. But, the price that has to be paid to acquire such appreciation can be extremely high.

What can be done to treat TBI's? There are several approaches to consider.

Perhaps the most obvious is to go to a facility that specializes in brain injury rehab. This is best done fairly early on after a brain injury has occurred. Such treatment programs are like any other educational approach: one is taught various skills, and they then need to be practiced on a regular basis.

I have never seen anyone recover all of their lost functions through a rehab program. A majority say that they have made reasonably good recovery through such assistance. The patients inevitably realize that some functions remain weak, as do their families, friends or employers. i.e. Rehab helps, but it does not fully cure.

A second approach is to use psychiatric medication symptomatically. One of the more common problems after a TBI is poor attention and focus, which is fairly similar to attention deficit disorder (ADHD) in its appearance. There are any number of drugs that can help a person be more attentive.

Other TBI patients struggle with depression, such as being more socially withdrawn, isolated, or otherwise unable to handle the demands of being with most people in their lives. Antidepressant medication is often prescribed to them.

A third set of TBI patients have major problems with poor frustration tolerance, increased irritability or aggression, and are disinhibited. For such individuals 'mood stabilizing' drugs are often recommended which helps even out such surges of emotion.

In my experience only a small percentage of TBI patients get any help through such medication. The vast majority complain of side effects being too severe, with the phrase of 'becoming a zombie' the most common one I hear. As a result, most TBI patients I have met may have tried various medications, but few are able to take them for any length of time.

Side effects are more intrusive to a TBI patient than someone who has not suffered such an injury. Consider what happens when a brand new, fresh off the showroom floor, car or truck tows some heavy trailer up a steep road. It has the capacity to take such a load with relative ease. Everything is new and working well. Now take the same vehicle but after it has been driven 200,000 or 300,000 miles. How well will it tolerate the added strain of towing a heavy trailer? Every system, be it engine, transmission, suspension, etc. is aged and worn out. The odds are that any extra strain on the entire system will cause something to break. The same is true for people relative to medication side effects. The healthy brain can take the adverse consequences of drugs far better than the injured one, which has in effect undergone premature aging of its capabilities.

This is not to say that medication should never be tried. It is worth considering. Discussing the issues with a medical doctor of one's choice, and further educating yourself as to what might be right for you is always a good idea. But, medication is like rehab: do not expect a miracle cure and a full return to one's previous abilities.

A third approach to dealing with brain injuries is more personal. In simple terms, work harder and live healthier and you will do better. Families can also help toward such an end.

The absence of such an approach or set of values is the best way to illustrate what it can do in aiding recovery from TBI.

Work harder: it is very hard to succeed in any aspect of life if one never tries. We all can think of exceptions to such a rule, such as the person who never studies and makes A's in school anyway. But, the general principle remains true. Learning, or recovery from the impairments of TBI, takes effort. The more effort you put in the better you will do, all things being equal.

Live healthier: the absence of this is like the lung cancer or emphysema patient most of us have seen or heard about, who once diagnosed continue to smoke anyway. When are you going to learn? What is required to make you change self-destructive habits?

There have been any number of TBI patients I have seen over the years, often injured while they were driving drunk, that continue to drink alcohol. Some have even continued to engage in drunk driving. Others suffer brain damage from illegal drugs, such as cocaine or amphetamines, and have strokes or heart attacks which leads to brain damage. The message here is that when brain damage has occurred due to a serious breach of judgment, common sense, responsibility, or other factor – it is best not to compound one's problems and continue on the same path. Remember the geometric increase in risk of TBI measured against the number that has occurred? Or, how to count TBI's: 1, 2, 3, too many too keep track of. Don't make it worse by being self-destructive. Live healthier.

Family and friends can aide a TBI patient in various ways, which can make a significant difference in recovery. Emotional and financial support matter. 'Running interference' helps – such as taking on some of the burden of chores, like dealing with insurance companies, disability policies, employers' demands, etc. so that the patient spends more energy on recovery and less on the wearisome tasks of rules and bureaucracy.

The personal approach to dealing with TBI is not mutually exclusive to the other two. They can all be used, or at least tried, in conjunction with each other. But, in my experience the people who do the best are the ones who try the most. Very little can be accomplished if a TBI patient gives up, does not care, or otherwise is indifferent toward recovery.

Lessons to be learned

Given that motor vehicle accidents account for roughly 50% of all TBI's in the U.S., the best approach to avoiding putting yourself or others you love at risk for a brain injury is to drive carefully and responsibly at all times. At a safe speed. In a car maintained and kept in good repair, such as with fully functioning brakes and steering. Not under the influence of alcohol or drugs. Not when you are ready to fall asleep at the wheel. Not when you are seriously distracted by commotion in the car such as a teen driver with rowdy peers as passengers.

You should also learn and remember that technology has its limitations. Seat belts and air bags can only go so far in protecting a person. And their ability to prevent brain damage in a MVA is

actually far less than most realize. The problem is that the brain is basically sloshing around inside the skull, floating on cerebrospinal fluid. As such it will be hurled in to the interior walls of the skull when MVA's occur. Soft brain tissue thrown against hard bone is no match. That is, there is no seat belt or air bag *inside* the skull that will absorb the impact that occurs there. So, avoid car accidents to the best of your ability.

Other lessons to be learned here is to be careful and act with forethought in other potentially hazardous situations. Falls around the house are a major cause of TBI's. This may include falls down stairs, out of windows or balconies, off ladders, out of trees, or from bikes ridden in the neighborhood. Think. Wear helmets. Don't take unnecessary risks.

Sports are a hidden source of TBI's, as I mentioned at the outset of this article. I have seen many individuals over the years who probably suffered brain damage from sports, though virtually none were diagnosed before seeing me. That is, almost all such injuries go unrecognized. All types of sports are potentially dangerous. Baseball, football, soccer, hockey, basketball, lacrosse, hang gliding... I've seen brain damage from all of these. Helmets may help. Realizing that 'it's only a game' may help even more and keep you or your loved ones safe.

The final thought to keep in mind is that virtually everyone I have seen who has suffered a brain injury regrets that single brief moment in time that it occurred. A blink of an eye. A fraction of a second. That's all it takes for a person's life to be permanently altered for the worse. There is no way to undo what happened, to erase the accident and injury.

So, be careful. Act prudently. Think. You only have one brain for your entire life time. Protect it and treasure its abilities, and you will live a far better life.