Traumatic Brain Injury:
A Guide For Patients

Traumatic brain injury (TBI) occurs when a sudden trauma, such as a blow or jolt to the head, causes damage to the brain. Such injuries can result in impaired physical, cognitive, emotional, and behavioral functioning. Approximately 1.4 million individuals sustain a TBI each year in the United States. In times of combat, 14-20% of surviving casualties suffer a TBI. The number of TBIs resulting from recent combat in Iraq and Afghanistan is so large that TBI has been called the "signature wound" of the OEF and OIF conflicts.

What causes TBI?

Automobile accidents, falls, assaults/blows, sports-related injuries, and explosive blasts are common causes of TBI. When an individual suffers a TBI, the brain can be injured in a number of different of ways. For example, the brain may be shaken within the skull causing bruises (also called contusions) to form at the sites of impact. Like bruises elsewhere on the body, these will heal with time. Swelling may occur if there are many bruises on the brain, which can take a while longer to return to normal.

Brain injury can occur even when there is no direct blow to the head, such as when a person suffers whiplash. When the head is rapidly accelerated and decelerated, as in an automobile accident, twisting or rotational forces may stretch and even sever long-range connecting fibers in the brain. Damage to these fibers disrupts communication between nerve cells, and thereby reduces the efficiency of widespread brain networks.

Damage to blood vessels surrounding the brain is another common source of injury, causing bleeding between the brain and skull. This bleeding often stops on its own and the blood vessels heal like any other cut.

Exposure to rapid pressure changes, such as the overpressurization and underpressurization waves that accompany explosions, can also cause damage to the brain. These pressure shifts induce air bubbles to form in the bloodstream, which can then travel to the brain and interrupt its blood supply.

How serious is my injury?

The severity of TBI can range from "mild" (characterized by relatively brief changes in mental status or consciousness following the injury) to "severe" (characterized by an extended period of

unconsciousness or amnesia after the injury). Thus, the length of time that a person is unconscious is one way to measure the severity of the injury. If you weren't knocked out at all or if you were unconscious for less than 30 minutes, your injury was most likely minor or mild. If you were knocked out for more than 30 minutes but less than 6 hours, your injuries were probably moderate.

Approximately 80% of TBI cases are classified as mild, with emergency room visits for mild TBI (MTBI) topping one million each year. Although this is a very high number of cases, there may even be more MTBIs than that. We don't know for sure because a number of cases go unreported or undetected. MTBIs are especially difficult to diagnose because these individuals typically do not show obvious physical signs of injury (for example, skull fracture), and rarely display evidence of brain damage on neuroimaging exams.

The term "mild" may be misleading in reference to brain injury. Although someone may only be dazed or confused or have a brief loss of consciousness in MTBI, evidence of impaired brain function is often clear. Cognitive changes, headaches, dizziness, and a number of other symptoms may be observed following MTBI. The actual harmful effects on daily functioning of persons with MTBI may be large depending on what type of activities that person must do on a daily basis.

How is TBI diagnosed?

Diagnosis of TBI is difficult because affected individuals may not show physical signs of injury. Even sophisticated neuroimaging techniques may fail to detect signs of brain injury. Tests such as EEG, CAT scans, and MRIs are often "normal." Typically, only relatively large abnormalities are detected by current clinical imaging techniques. Neuropsychological testing may be performed in cases of suspected TBI and can be an effective method of identifying associated cognitive deficits. A comprehensive neuropsychological battery takes several hours to administer and includes a broad range of tests. On formal testing, persons with TBI may show problems in information processing speed, memory, and distractibility. By one month, the effects are usually mild in young persons with no previous problems with health or thinking. By about three months, these problems resolve in most cases, although a few will continue to have difficulties.

What are the common symptoms of TBI?

After TBI, persons often report symptoms in the days, weeks, and perhaps months following injury, but do improve over time. The most common symptoms after head injury are known as post-concussion syndrome (PCS). These symptoms include physical complaints (dizziness, fatigue, headaches, visual disturbances, trouble sleeping, sensitivity to light and sound, poor balance), cognitive changes (poor concentration, memory problems, poor judgment and impulsivity, slowed performance, difficulty putting thoughts into words), and psychosocial concerns (depression, anger outbursts, irritability, personality changes, anxiety).

These symptoms are part of the normal recovery process and are not signs of brain damage or medical complications. These symptoms are expected as you get better and are not a cause for concern or worry. The majority of patients with PCS recover completely in 3 to 6 months. For a minority of patients, approximately 20%, symptoms may persist for a longer period of time. Most patients don't develop PCS symptoms until days or even weeks after the accident, but the syndrome can begin sooner. Either way, the symptoms often disappear without any special treatment. A list of some of the symptoms you can expect is shown below, along with the percentage of head injured patients that experience each symptom at some point during their recovery.

Symptoms of Post-concussion Syndrome

Symptom	Percentage
Sleep difficulties	80%
Poor concentration	71%
Irritability	66%
Fatigue	64%
Depression	63%
Memory problems	59%
Headaches	59%
Anxiety	58%
Trouble thinking	57%
Dizziness	52%
Blurry or double vision	45%
Sensitivity to bright light	40%

When unrecognized and untreated, these symptoms often disrupt the individual's work setting and family relationships. People frequently report feeling as though they are "going crazy." Healthcare providers may consider them overanxious and therefore fail to diagnose TBI, when what the patients are truly experiencing are the symptoms of the TBI.

What can I do about these symptoms?

PCS is a normal part of recovery. Most patients will be back to normal by 3 months without any special treatment. The symptoms are not a sign of relapse or brain damage. The syndrome is expected even after minor head injury. Few patients will experience all of the symptoms, but even one or two of the symptoms can be unpleasant.

Some patients find that at first, PCS makes it hard to work, get along at home, or relax. The best way to deal with this is to resume activities and responsibilities gradually, a little at a time. The

time you spend at work, getting together socially, with your family, or exercising should be determined by what you are comfortable with. You should pace yourself, and be sure to get all the rest you need. If your symptoms get worse, or if you notice new post-concussion symptoms, this is a sign that you are pushing yourself too hard. Ignoring your symptoms and trying to "tough it out" often make the symptoms worse. Symptoms are your body's way of giving you information. A broken bone or a torn muscle hurts so that you won't use it and it has time to heal. Post-concussion syndrome is your brain's way of telling you that you need to rest it. Most doctors who treat head injuries agree that recovery is faster when the patient gets enough rest and resumes responsibilities gradually.

Scientific studies by neurologists in the Netherlands show that 1 week of relaxing at home and then a week of gradually increasing activity after leaving the hospital is best for most patients. Most of the patients who took this advice were back to normal at work or school in 3-4 weeks. Most of the patients who weren't told what to do took 5-12 weeks to get back to their normal routine. They also had more post-concussion symptoms, especially irritability, trouble concentrating, and memory problems, than patients who returned to their routines gradually.

Thinking and worrying about your symptoms can make them seem worse. This is partly because paying attention to a feeling seems to magnify or increase it. If you pay attention to your heartbeat or breathing for a minute or two, you will see that the sensations seem to become more noticeable. Concentrating on the symptoms of PCS will also make them more noticeable.

It is important to remember that the symptoms are a normal part of recovery and will likely go away on their own. Of course, we all have some of these symptoms once in a while anyway. After a head injury it can be easy to forget that we were sometimes irritable, tired, had headaches, couldn't concentrate, or forgot things even before the accident. Try to deal with these things the same way you did before.

Some of the symptoms you notice may actually have nothing to do with your head injury. The symptoms of PCS are pretty much the same as the symptoms of ordinary day-to-day stress. A list of symptoms is shown below, along with the percentage of people who experience each symptom even though they didn't have a head injury.

Symptoms of Everyday Stress

Symptom	Percentage
Poor concentration	14%
Irritability	16%
Fatigue	13%
Depression	20%
Memory problems	20%
Headaches	13%
Anxiety	24%
Trouble thinking	6%
Dizziness	7%
Blurry or double vision	8%
Sensitivity to bright light	14%

The reason that the symptoms of PCS are so much like the normal signs of daily stress is that one main cause of these symptoms is exactly the same: everyday stress. Of course your TBI has a lot to do with it, but having a head injury adds more stress to your life, not just bumps and bruises to your head. The accident itself, being in the hospital, and going back to work and school are all things that add stress to most patients' lives. Bills can pile up, time is lost, there may be injuries to other parts of your body. And just like a pulled muscle or bruised leg, your brain takes some time to recover. You may have some trouble with work or school at first, and this may be stressful and frustrating, even though it is normal. Trying to do your regular work right after a head injury is like trying to run with a pulled muscle. You can't see it, it may not be serious, but it takes some time to get better.

Another main cause of stress after a head injury is worry about the symptoms you have. Scientific studies by neurosurgeons and neuropsychologists in New Zealand show that patients who get an information booklet like this one recover faster and feel better during recovery than patients who don't know what to expect. That's why we gave you this booklet! Doctors in the United States who treat head injuries agree that the single most important factor in recovery is that you know what to expect and what to do about the symptoms.

Managing specific symptoms

Poor Concentration

The main cause of poor concentration is tiredness. When it becomes difficult to concentrate on what you're doing, take a break and relax. Between 15 and 30 minutes a day should be enough. If you still continue to have problems, your work day, class schedule, or daily routine should be temporarily shortened. Trying to "stick to it" won't help, and usually makes things worse.

Reducing distractions can help. Turn down the radio or try to work where it's quiet. At first, avoiding noisy environments may be helpful, then return to them gradually. Don't try to do too many things at once. Writing while you talk on the phone or taking notes as you listen to someone are examples of doing two things at the same time. It may be difficult for you to concentrate on more than one thing at first. You will be better able to concentrate when you've had enough rest. So, if you really need to concentrate on something important, do so when you're feeling fresh.

Fatigue

It is normal to be more tired after a head injury. Most people experience some degree of fatigue during their recovery. The only sensible treatment for being tired is rest. Avoid wearing yourself out. Gradually increase your activity level. You may find that you need to sleep more than usual, in which case it is a good idea to get the extra sleep that you need. Most patients have more energy in the morning than later in the day. An afternoon nap can help if you find that it is harder to do things at the end of the day. Physical and mental fatigue usually diminishes over time; it should be greatly improved within 6 months after a brain injury.

It may seem counterintuitive, but a well-designed exercise program can help your physical and mental endurance. Adding activity gradually is the key. For instance, an hour of morning activity may be all that you can handle. From there, you slowly and incrementally add activity followed by rest breaks. Closely monitor your fatigue levels until you reach an acceptable level that you can tolerate, and be careful to avoid extreme fatigue.

Simple suggestions to reduce fatigue:

- Follow a regular sleep schedule and reduce disruptions. Try to sleep for at least 8 hours per night.
- Take scheduled naps and rest breaks, but be increasingly active in between.
- Do strenuous activities when energy is normally highest and rest when energy is normally lowest.
- Simplify tasks whenever possible - conserve your energy.
- Add tasks only as you can tolerate them, slowly and incrementally.
- Set a cut-off time for ending daily activities.
- Plan proper nutrition. Eat healthier foods and stay on a fairly structured routine.
- Use stress management and relaxation techniques.
- Get help to become and stay organized.
- Start a diary to understand patterns and triggers of fatigue.

Sleep Difficulties

You might expect that the fatigue you experience during recovery would cause you to sleep more soundly. However, sleep disturbance is actually quite common following a brain injury. Studies have shown that individuals who suffer a brain injury often have difficulty getting to sleep and maintaining uninterrupted sleep at night, and thus experience excessive daytime sleepiness. When they do sleep, their sleep is lighter and less restful, and they frequently awaken. Getting adequate sleep is very important in the healing process. If you don't sleep well at night, you'll be more tired during the day. When you're tired during the day, you'll find it difficult to concentrate, and may become irritable and angry more easily. Thus, lack of sleep can exacerbate your other symptoms.

Simple suggestions to improve your sleep habits and routines:

- Wake up at roughly the same time each morning.
- Avoid caffeine, especially in the evenings.
- Avoid exercising late in the evening.
- Set your bedroom temperature to a comfortable level.
- Ensure that your bedroom is quiet and dark.
- If you take daytime naps, try to rest long enough to re-energize (30 minutes or less should be sufficient), but not so long that you'll have difficulty falling asleep in the evening.

Irritability and emotional changes

Some people show emotions more easily after a brain injury. They may yell at people or say things they wouldn't normally say, or get annoyed easily by things that normally would not upset them. Some may even get violent. You may also find that you get more emotional in other ways, getting frustrated or tearful when you normally wouldn't. This behavior does not necessarily mean that you are feeling a deep emotion, but can occur because the brain is not regulating emotions to the same extent as before the injury. If any of these episodes happen, it is usually a sign that it is time to take a rest from what you are doing and get away from it. There are a variety of different techniques to deal with irritability. Some people find that leaving the frustrating situation temporarily is helpful. Others employ relaxation techniques or attempt to use up emotional energy through exercise. One frequent cause of irritability and emotionality is fatigue. People lose their tempers more easily when they are tired or overworked. Adjust your schedule and get more rest if you notice yourself becoming irritable or emotional.

Everyone gets angry from time to time, often with good reason. Being irritable only becomes a problem when it interferes with your ability to get along with people from day to day. If you find yourself getting into arguments that cause trouble at home or work, try to change the

way you think about things. Thoughts often make us more angry than what actually happened. You can see this yourself my imagining an irritating situation and why it would make you angry.

There is usually a reason that irritating things happen. When something makes you angry, ask yourself what caused it. Family, friends, or co-workers can do things that bother us at times. Try to think of why they did whatever it was that irritated you. What would they say the reason was? Thinking about what caused a problem is the first step toward solving it.

Problems can usually be solved better if you stay calm and explain your point of view. The steps you need to take to solve a problem will be the same when you are calm as they would be if you were irritated. Try to remind yourself of this when you find yourself becoming irritable.

You can usually come up with several ways to solve a problem. Try to think of at least five different ways, and then decide on which is best. Just realizing that there are several things you can do to solve a problem will make it a lot less irritating.

Depression

For reasons we do not fully understand, depression seems to occur more often after a brain injury. More than one-third of people with recent traumatic brain injury become depressed, especially during the first year after injury. One reason for this increase in depression may be because brain injury causes an imbalance in certain chemicals in the brain and disrupts brain networks critical for mood regulation.

Another cause of depression in TBI may be psychological and social changes such as losing friends, losing abilities, and not being able to return to work or other meaningful activities after injury. Simply put, people become depressed when unpleasant things happen to them, and a head injury is unpleasant. We feel good when good things happen to us. Thus, an effective way to treat depression is to make sure that good things happen. One way to do this is to plan to do something enjoyable for yourself each day. Make your plan specific, and then be sure to stick to it. Decide on an activity you like and exactly when you are going to do it. That way you can look forward to it. Anticipating and doing enjoyable things each day will improve your mood.

Chances are that if you are depressed, you are telling yourself things that are depressing. Thinking that the situation is terrible, that there is no end to it in sight, that you aren't able to do anything about it, and that it is your fault are all depressing things to tell yourself. Thinking this way can become a habit if you do it enough. Usually, when people tell themselves unpleasant things all the time it is out of habit, not because those things are really true. If you find yourself thinking depressing thoughts, stop. Simply stopping a depressing thought can make you feel better. See if what you are telling yourself is really true.

Memory problems

Memory difficulties have several causes. The part of our brain that stores memories is called the temporal lobe. This is the part of the brain that is most likely to be bruised in a head injury. Some memory difficulties can be caused by the bruises, which is why you may not remember the accident very well. Like a black and blue mark on your arm or leg, these bruises will recover with time. Your memory will most likely improve as this happens. Most of the memory problems that patients notice after a head injury are not caused by bruising. They usually come from poor concentration and being tired. For you to remember something, you have to pay attention to it first. If you don't concentrate long enough, the information is never stored in your memory. Concentration problems are a normal part of recovering from a head injury and some memory trouble is a normal side effect of this. You will probably be able to concentrate and remember better when you get enough rest. Memory problems can be a sign that you are pushing yourself too hard. Writing important things down, using a pocket tape recorder, and asking for reminders are other excellent ways of coping with temporary memory difficulties. They will help recovery and not slow it down.

Of course, nobody's memory is perfect anyway. After a head injury, it can be easy to forget that we sometimes had trouble remembering things even before the accident. Some of the symptoms you notice may actually have nothing to do with your head injury. A list of common memory "problems" is shown below along with the percentage of people who experience each "symptom" even though they didn't have a head injury.

Things We Normally Forget

"Symptom"	Percentage
Forgets telephone numbers	58%
Forgets people's names	48%
Forgets where car was parked	32%
Loses car keys	31%
Forgets groceries	28%
Forgets reason for entering room	27%
Forgets directions	24%
Forgets appointment dates	20%
Forgets store locations in mall	20%
Loses items around the house	17%
Loses wallet or pocketbook	17%
Forgets content of daily conversations	17%

Worrying about remembering things that you would normally forget can make your memory seem worse to you. If you can remember your memory problems, you probably don't have

much of a memory problem! People with serious memory difficulties are usually not upset by their symptoms. They don't remember that they have any memory trouble.

Headaches

Headaches are part of the normal recovery process, but that doesn't make them any less bothersome. Not only are they painful to experience, but frequent headaches can take a toll on you mentally and emotionally, and are a common cause of irritability and concentration problems following a head injury. This guide cannot replace the medical advice that you should get if you are bothered by headaches. Headaches can have many causes, and your doctor will want to diagnose the problem and prescribe medication that can help if you need it.

One of the most common causes of headaches after a head injury is stress or tension. This is usually the cause when the headaches start for the first time several weeks after the injury. These headaches mean that you are trying to do too much. They will probably disappear if you take a break and relax. Your workday, class schedule, or daily routine should be temporarily shortened if you continue to have headaches. Stress or worry cause tension headaches by increasing muscle tension in your neck or forehead. These muscles become tense and can stay tight without you realizing it, out of habit. They can become even tighter once a headache starts, because muscles automatically tense in reaction to pain. This muscle tension makes the headaches worse.

If you have tension headaches, relaxing your muscles can help. One way to do this is with a method called progressive muscle relaxation. Start by clenching your hand into a fist, as hard as you can. Notice how the muscle tension feels. Now relax your hand completely and notice the difference. Now clench both your hands as hard as you can and hold them that way for a moment or two before letting them relax completely. Notice the difference. Now continue to tense and relax more muscles groups by adding a different set each time: hands, arms, face, chest, stomach, buttocks, legs, feet. This method works best if you are lying on your back. Finally, tense all the muscles in your body at once as hard as you can, and then let them relax. At this point all your muscles will be very, very relaxed. Progressive muscle relaxation can help prevent tension headaches by relaxing your muscles. This works best if you practice it each day at about the same time for 5 minutes or so. But, be sure that you DO NOT use this technique while you are having a headache.

Anxiety

Worry about symptoms and problems at work is the main cause of anxiety for many patients. Anxiety should not be a problem for you if you understand that your symptoms are a normal part of recovery, get enough rest, and gradually increase your responsibilities at work. If you are anxious, chances are that you are telling yourself things that are making you that way. Usually, when people worry all the time it is out of habit, not because the things that they are telling themselves are really true. The steps you need to take to solve a problem will be the

same when you are calm as they would be if you were anxious. If you find yourself thinking anxious thoughts, stop. Simply stopping an anxious thought can make you feel better. See if what you are telling yourself is really true.

Confusion and trouble thinking

Many people feel uncertain, perplexed, or confused after a head injury. They find that their mind and feelings don't react in the ways they used to. They may fear that they are "going crazy." This is a normal reaction to a head injury. If you have these feelings, it is good to talk about them with someone you trust.

Trouble thinking is often a side effect of other symptoms. Concentration problems, being tired, headaches, and anxiety can all make it hard to think clearly. Like these other symptoms, trouble thinking is probably a sign that you are doing too much too soon.

Dizziness, visual difficulties, and light sensitivity

Dizziness and visual difficulties should be checked by your doctor. These symptoms usually go away by themselves in 3-6 months or less in most patients. If you find these symptoms troublesome, your doctor may want to prescribe medication for motion sickness, or eyeglasses. Some motion sickness medications are very effective for dizziness, but can make you drowsy or reduce your attention span as side effects.

You may notice some increased sensitivity to bright light or loud noise, particularly if you have headaches. Some increased sensitivity is normal after a head injury. But, scientific studies by neurosurgeons and neuropsychologists in New Zealand show that a person's actual sensitivity to light and noise has nothing to do with how much light and noise bother them. Paying attention to these symptoms makes them seem worse, because paying attention to a feeling seems to magnify or increase it. The less you think and worry about your symptoms, the faster they will usually go away.

Are there treatments for TBI?

Research on treatment for TBI has not come up with a single treatment that is effective for all patients. Many people recover without any formal treatment. Usually, they get better rapidly in the first few days, and problems that linger may clear up in a few weeks. Some problems become more apparent as you return to your usual activities. For example, you may not realize that you get tired easily until you return to your usual activities. Even so, people usually get better after a head injury, not worse.

Until recently, little more than acute medical treatment was provided for survivors of mild TBI. People were often discharged from emergency rooms without adequate follow-up. Today, however, rehabilitation programs are available to address cognitive retraining, psychosocial adjustment, communication and leisure skills, and vocational issues. With appropriate support and therapy, individuals with difficulties related to TBI can learn to overcome and compensate for their deficits, resulting in successful reintegration into their home and work environments.

Returning to school or work

Returning to school or work is often one of the most difficult phases of recovery from brain injury. This is because a number of TBI symptoms can interfere with your ability to manage the demands of work and school environments. For example, concentration difficulties and memory problems may affect your capacity to learn new things in school. Or fatigue may limit your ability to effectively handle work responsibilities throughout the day. One important thing to keep in mind when attempting to return to work or school is that the process will be gradual. It would be unreasonable to expect yourself to immediately perform at the level you were functioning prior to your TBI. Instead, you should gradually resume responsibilities as you are able. Slowly increase your workload and hours when you feel fully equipped to handle such increases.

When returning to school, be sure to find out what special help and accommodations are available to you. You may be eligible for extra test-taking time, help with note taking, etc. A visit to your school's "student services" or "disability services" office will help you determine the resources available and how to obtain them.

Some general advice to aid recovery:

- Cut back on work and duties. Gradual resume activities as you are able.
- Get plenty of rest. Aim for 8 hours per night and take naps as needed.
- Stay away from alcohol and non-prescribed drugs. Your brain will not deal with alcohol and drugs in the normal way.
- Simplify your life and activities. Try to follow a consistent daily routine.
- Write things down and ask for reminders.
- Do one thing at a time.
- Decrease distractions as much as possible while attending to a task.
- Eat healthy food and try to exercise regularly.

Summary

The most common symptoms after a head injury are known as post-concussion syndrome. These symptoms are part of the normal recovery process and are not signs of brain damage or medical complications. They are not a cause for concern or worry. Post-concussion syndrome is more common after mild head injury. Few patients will experience all of the symptoms. The symptoms may not develop until days or even weeks after the accident. Most patients will be back to normal within 3 months without any special treatment. Most doctors who treat head injuries agree that recovery is faster when the patient gets enough rest and resumes responsibilities gradually. If your symptoms get worse, or if you notice new post-concussion symptoms, this is probably a sign that you are under too much stress. Your workday, class schedule, or daily routine should be determined by your own comfort level.

About this guide

This guide was provided by the CogSMART program of the VA San Diego Healthcare System. The material presented is based on published scientific research and clinical studies and was adapted from a variety of sources including:

Mittenberg, Zielinski, & Fichera, (1993). Psychotherapy in Private Practice, 12, 37-52.

Raskin & Mateer. (2000). Neuropsychological Management of Mild Traumatic Brain Injury. 65-68.

The Veteran's Health Initiative TBI information packet

Educational resources from the University of Washington Traumatic Brain Injury Model System website (http://depts.washington.edu/uwtbi/)