Family Guide

TO THE CRITICAL PHASE OF

Brain Injury

BRAINTRUST Canada Association
in partnership with the Interior Health Authority

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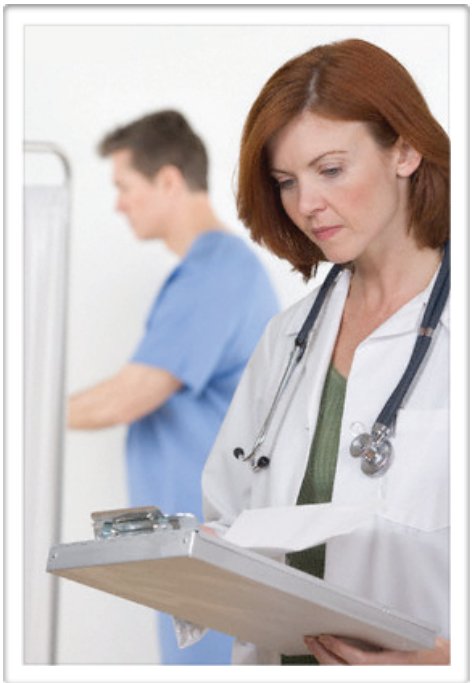
If you are reading this guide, it is likely that someone you deeply care for has sustained brain injury serious enough to have required intensive medical intervention. Your loved one may be in an intensive care, surgical or acute care medical unit in the hospital and you may find yourself struggling to understand some of the complex critical care issues that have surfaced at this time. Because your injured family member is not in a position to participate in decisions about his/her own care, it may be that you are being asked to consent to treatments and procedures with which you are unfamiliar. It is very distressing to see someone you love hurt and unconscious with tubes and lines running from his/her body to monitors and other equipment. Although members of the health care team do their best to explain the procedures and what has caused your loved one to require such intensive care, it is sometimes difficult to absorb and retain this information.

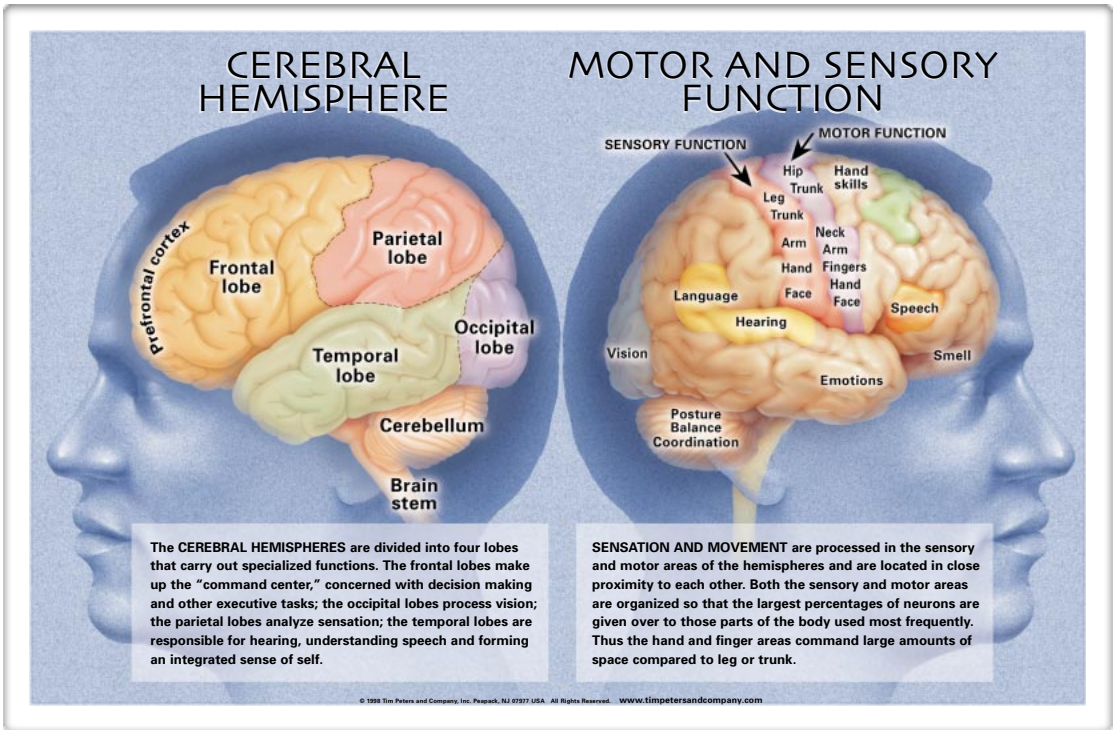


This guide has been designed to give you some information to assist you through the critical phase of your loved one's recovery.

- the first section provides a simple introduction to the brain and explanations of how brain injury can occur.
- the second section gives information on some procedures and treatments commonly practiced in critical care medicine.
- the final section is a glossary that provides definitions of terms you will read in this guide and may also encounter as your loved one receives acute medical attention. An attempt has been made to touch on the most common conditions, procedures and medical terms. However, you may encounter terms which are not described here. The health care team considers the role of informing and educating family members as important. Therefore, if you feel you require further explanation of treatments and medical terms, you need not be afraid to ask, and ask again . . . they expect that you will.

In order to understand the nature of brain injury, it is helpful to understand some basic brain anatomy (see fig. 1). The brain is very delicate and is comprised mostly of gelatin-like tissue that houses a mass of nerve matter, not only allowing us to think but also to control our voluntary functions (such as movement, etc.) and involuntary body functions (breathing, digestion, etc.). The bones of the skull (cranium) and the cerebrospinal fluid in which the brain floats, protect the brain. There are several cavities or ventricles in between brain tissues which are also filled with cerebrospinal fluid. Three layers of membrane called meninges cover the brain and provide an envelope for the cerebrospinal fluid.

The cerebrum comprises 7/8 of the brain's mass and is divided into a left and right hemisphere. The cerebellum (meaning "small brain") is located beneath the cerebrum. It too is divided into two hemispheres and is connected to the brain stem.



What is brain injury and how does it occur?

Traumatic brain injury most often occurs as a result of a blow to the head. They can be open, that is, the skull and brain have been penetrated by an object or the bones of the skull have been dented and have damaged the brain or closed where the skull is not penetrated but injury to the brain still occurs. A **skull fracture** occurs when the bones of the skull have been broken or cracked. The presence of a skull fracture does not necessarily indicate brain damage. Most skull fractures heal themselves but if they exert pressure on the brain they may require surgery to prevent further damage. Penetration of the brain or meninges by bone fragments can cause direct damage to nerve tissues and blood vessels.

In a closed head injury, the skull appears to be undamaged but injury to the brain has occurred as a result of the brain coming in contact with the skull or rotating inside the skull at high speed. In either case, injury may be caused by the bruising, shearing or tearing of connective tissues, the meninges or delicate brain matter. If blood vessels are broken, a pool of blood may form (**haematoma**) between the skull and the meninges , between the meninges and the brain, inside brain tissue or in between segments of the brain. When the brain has been damaged, it often causes swelling which puts pressure on the brain and can cause further damage by reducing the brains blood supply and damaging nerves.

Injury to the brain can result from other conditions as well. The restriction of blood and oxygen to the brain for several minutes at a time can cause injury to the brain. For instance, choking, hanging or drowning hinder the flow of blood and oxygen to the brain and result in **anoxia**. The brain can also be damaged by an **aneurysm** (a weak section in an artery wall) which may balloon out and burst under pressure from blood flow. This usually calls for a surgical procedure that involves clipping the aneurysm and removing the blood. An abnormal tangle of blood vessels (**arterial venous malformation**) and **stroke** can cause damage similar to an aneurysm. Diseases and infections in brain tissue or the fluids which surround and protect the brain can cause brain damage as well.

ICU - Intensive Care Unit

Family members often report their experience of the Intensive Care Unit (ICU) as being very unsettling and overwhelming. It is traumatic to see your loved one hooked up to various machines and monitors and after all they've already been through, you may be wondering whether all of it is necessary. The ICU is intended to provide, as the name suggests, intensive monitoring of vital functions and quick response to changes in these functions. If your loved one has been moved to the ICU, it means that his/her condition is still fragile and may need to be stabilized before further medical intervention is attempted. When there are concerns regarding injury to the central nervous system, it may mean that vital functions such as the ability to self-regulate breathing, heart rate, etc. may be temporarily impaired. It is essential then to give the brain and the body the help it needs to to restore these self-regulating abilities.

Most of the medical devices and machinery that you observe are intended to regulate and facilitate the use of fluids and oxygen in the body. For instance, a **respirator** or ventilator is

commonly used to move air into the lungs when a person is unable to breath for him/herself. An **endotracheal tube** is inserted through the mouth and is connected to the ventilator which controls the rate of breathing, the pressure of breathing and the depth of the breathing. An alternative to the endotracheal tube, a **tracheostomy**, is sometimes needed for people who are not able to clear their own airways or need a ventilator for more than a short time. This involves creating a small, temporary opening at the throat into which a tube is inserted and connected to a respirator, to a supply of moist air or to supplemental oxygen. A tracheostomy may seem unnecessary when a tube through the mouth is also an option. However, it is sometimes the preferred choice since prolonged use of a mouth-fed tube can lead to a narrowing of the airway and can be more uncomfortable than a tracheostomy. To prevent infection and pneumonia, nurses keep the airway clean by suctioning the tube and sometimes encourage coughing by squirting a small amount of saline solution into the tube.

There are often many **intravenous lines** (narrow tubes inserted into veins and arteries). These may be used to provide nutrients, to help with fluid balance and to monitor the oxygenation of blood at lung and heart sites. **Intracranial pressure (ICP)** lines are sometimes inserted when brain injury has been identified. These lines pass through the skull to points inside or near the brain to monitor pressure, allowing fluids to drain if the pressure is too high. Drainage may be very important since the swelling and bleeding caused by injury to the brain may create pressure in the skull that can potentially do more damage to the brain if not dealt with.

Several methods can be used to reduce the ICP including raising the head of the bed, using medications or increasing the breathing rate to reduce the amount of carbon dioxide in the blood. In some instances, a coma is drug-induced to reduce the oxygen requirements of the brain. Cerebral fluids may be drained by creating a burr hole in which a shunt is inserted for drainage. A large mass of blood on the surface of the brain (haematoma) may be surgically removed if the bleeding is chronic and/or the blood has jelled and is therefore inaccessible to drainage. Hemorrhages inside the brain often, given time, dissolve themselves and are less frequently surgically removed due to the potential danger of this surgery. The goal in all of these procedures is to prevent further damage to the brain by keeping the pressure in the brain low enough to allow adequate pressure of oxygenated blood coming into the brain.

Coma

A coma is a state of deep sleep or unconsciousness from which one cannot be aroused at a given time. From a practical point of view, coma ends when the individual opens his/her eyes and can respond to stimulation. In the medical sense, coma occurs at a range of levels, from a deep state of coma to a lighter state where there is some awareness of self, immediate surroundings and some ability to respond. Movie portrayals often give the

impression that a comatose person awakens suddenly and after a few minutes of confusion is up and about, and functioning as usual within a day or two. In reality, coma actually resolves itself gradually. Depending on the length of coma, it may take hours, days or weeks for a person to move from a deep state of coma to being able to become appropriately aware of and responsive to the environment. Even if brain injury has not affected motor functioning, it may take some time to recover from the muscle weakness lost from lack of use.

In the acute phase, the **Glasgow Coma Scale** is often used to determine the level of consciousness or coma. The coma level is identified on the basis of three criteria: eye opening, best motor response and best verbal response. The lower the number on the scale, the deeper the level of coma. Another device used to measure awareness and responsiveness is the **Ranchos Los Amigos Scale of Cognitive Functioning**. This scale determines eight possible levels of responsiveness and orientation, the lowest being level one in which the person is in a deep coma and is totally unresponsive, and the highest being level eight where the individual is completely aware and appropriately responsive.

Coma can sometimes serve a protective function. In a state of coma, the metabolism (rate at which the body consumes energy) slows down and the brain's oxygen and energy needs are reduced. In the critical stages of brain injury, a coma may be induced using drugs that have the effect of slowing down the metabolism. This treatment is intended to lower the brain's oxygen requirements while swelling of the brain has a chance to ease or haematomas are allowed to clear.

Seizures

In a minority of cases, brain injury can result in seizure disorder or **post-traumatic epilepsy**. Seizures may occur soon after brain injury or may not be seen until much later when scar tissue may have developed around the injury to the brain making the person vulnerable to seizures. Research evidence shows that some kinds of brain damage are considered at higher risk for the occurrence of seizures, while other kinds of brain injury have virtually no risk for seizure occurrence. If seizures occur or there are indications that the individual is at risk for seizure disorder, they may require prolonged use of anti-convulsant medications (medicines to control seizures). It is common practice to place a person with brain injury on anti-convusant medications in the Intensive Care Unit to prevent a seizure that could cause further damage. If you have questions or concerns about the potential for seizures ask your physician.

Heterotopic Ossification and Phlebitis

A rare physical complication, heterotopic ossification, can be a concern when injury involves shattered bones. It occurs as a result of the depositing of bone material in the muscles or soft tissues around major joints such as the shoulders, knees, hips or elbows. It causes swelling of a limb and is treated medically in the early stages. Phlebitis is the inflammation of a vein causing the blockage of blood flow from the limbs to the heart and may also cause limb swelling. This issue is usually seen in patients who are paralyzed or immobilized as a result of their injuries. Since the potential exists for the blockage to 'break off' and allow blood to flow into the lungs, resulting in a dangerous condition called **pulmonary embolus**, it requires immediate treatment. It is often treated with blood thinning medications or by implanting a filter or umbrella at the site to prevent the blood clot from moving.

Tube or Intravenous Feeding

Ensuring good nutrition is important to recovery from any medical condition. It is of special importance in the case of brain injury because of the increased release of adrenalin and other hormones in the body's glands which results in a huge increase in the nutritional requirements of the body. Intravenous feeding may be started immediately but soon may not be adequate to provide the needed caloric and nutritional requirements. The physician will assess your loved one's nutritional needs and may prescribe the tube feeding of a nutrient formula containing proteins, vitamins, carbohydrates and fats. Patients either are given an nasogastric (NG) tube or a percutaneous endoscopic gastrostomy (PEG) tube. The NG tube is fed through the nose and down into the stomach while the PEG tube is placed directly through the stomach so a patient is able to speak freely and is less likely to pull the tube out of place. If irritation of the nose, stomach or throat occurs, or if there is a tendency toward vomiting or inhaling food or other matter into the lungs, the tube may be placed directly into the intestine or stomach. If the gastrointestinal tract is not functioning adequately, feeding may be facilitated intravenously through blood vessels in the chest or neck.

Hydrocephalus

Normally, the brain produces a regulated amount of cerebrospinal fluid (CSF) which circulates around the spaces between the brain and skull and eventually is absorbed into the bloodstream. When brain injury has occurred, the brain may overproduce cerebrospinal fluid or the pathways for the flow of CSF may be blocked. In such a case, the pressure from the CSF may cause the brain to be squeezed when ventricles and the subarachnoid spaces (between the brain linings and brain tissue) become enlarged. Should this occur, the health care team will choose among a variety of procedures appropriate to the particular circumstances that have contributed to this condition.

Storming

"Storming" sometimes occurs for those with severe brain injury and produces rapid pulse, sweating, high blood pressure, and fever in some cases. It is controlled with medication and by eliminating pain sources and reducing stimulation. Physicians will also monitor circulation for the possibility of blockage or interruption of blood flow to or from a limb (ie: phlebitis or blood clots).

Contractures and Spasticity

In cases of severe brain injury, therapists are frequently called upon to help control contractures (*shortening and hardening of muscles, tendons, or other tissue, often leading to deformity and rigidity of joints*) and spasticity (*reflex resistance to passive movement of the limbs and difficulty in initiating and controlling muscular movement*) that can occur from lack of use or connected to the damaged area of the brain. Therapists may use any number of techniques including, casting, splinting, positioning and exercising to prevent joint deformity and maintain range of motion in muscles and tendons.

Once your loved one is medically stable and no longer requires the extensive use of life-support equipment, he/she may be ready to move to an acute care unit or the rehabilitation unit. Even though he/she may still require feeding tubes or urinary catheters, the move usually means there is no longer a need for major surgery, the inter-cranial pressure is normal, infections are under control and breathing and blood pressure have been stabilized. Moving out of the ICU can at once bring feelings of relief and anxiety. Remember that although your family member's condition is no longer critical, he/she will continue to be well monitored and cared for. Each unit has a Patient Care Coordinator (PCC), a nurse who will be preparing for the arrival of your loved one on the unit and can be consulted for information regarding his/her progress and the plans for treatment. Since your family physician may not be available whenever you have questions, the PCC can be a valuable resource to you.

Although a comatose person appears to be totally unresponsive, he/she often do hear. As mentioned in the previous pages, there are many levels of consciousness between coma and an alert, responsive state. Thus, care should be taken as to what is said in the presence of your loved one, especially regarding his/her prognosis.

Standing by while a loved one is comatose is very stressful for most family members. These feelings of helplessness can often add to the emotional strain of the situation. It is important however to provide a low stimulation environment with visits limited to 10-15 minutes, only 1-2 visitors at a time, and calm, low emotional discussion. If you would like more information on the most helpful ways of encouraging the recovery process, you can ask a member of the health care team.

Responding to the Person with Brain Injury

As your loved one awakens, he/she may be very disoriented, may not know where he/she is and may not even remember close family members. Often memories will return as recovery progresses, sometimes memories are lost forever. It is common for people with brain injury to be unable to recall the events that occurred just before the injury and to never regain these memories. Among many possible consequences of injury, your loved one may also find communication difficult and confusing and may have difficulty with balance, body movement and control. When these effects are evident, it is a sign that participation in a rehabilitation program is required. Your physician will discuss the options for further treatment with you. In the meantime, this can be disturbing to witness and understandably upsetting for the person with injury. Try to remember that the brain swells when injured and can take a few weeks to a few months to return to its previous size. The effects tend to be most severe in the early stages while the brain is still swollen. In most cases, the person's condition will improve as swelling is reduced and may continue to do so. Under the circumstances, it is quite normal to experience feelings of fear, anger, helplessness or despair. It will probably help to share these feelings with family, friends, members of a support group or a professional. However, in the presence of the person with injury, an attitude that is positive and reassuring is most helpful.

The person with brain injury may also begin to show signs of agitation (restlessness and upset) as coma lightens. At this stage, the agitation is usually the result of feeling unable to make sense of what is going on and feeling a need to do something but perhaps not knowing what to do or how to begin. There are several things you can do to help minimize confusion and agitation.

1) try to limit the amount of stimulation that your loved one is exposed to:

- speak in a calm voice at moderate volume;
- statements/questions should be short and direct, using simple language;
- move slowly and don't crowd the person with injury;
- limit visitors two or three at a time;
- keep lights down and tv or radio turned down or off.

2) redirect attention:

- get the person's attention and simply redirect them to another person or topic as this will assist them in focus on something different and lower the agitation;
- discuss topics that are non-threatening, non-emotional and are known to be familiar and calming to the person.

3) orient the person to reality:

- use the name of the person with injury, repeat who you are if she/he is still confused;
- your loved one may be quite fearful and needs structure, safety and familiar faces;
- provide a full explanation of what you are doing or your intentions before beginning a task/activity.
- avoid confrontation while the person is in an agitated state and don't leave him/her while agitated

Working with the Health Care Team

The ICU can be an intensely busy, treating many patients who are confronting critical, life-threatening issues. It is often a highly stressful environment to work in. While staff will do their best to be courteous and sensitive to your needs and wishes, their jobs often stretch their physical, mental and emotional capacities to the limit. Thus, they may not be able to respond to you as you might hope. Try not to take it personally if the staff do not seem to have time for you. Keep in mind that although they are professionals, they are still human, and like any of us, circumstances can occasionally get the best of them. Here are a few suggestions to keep in mind when dealing with the health care team:

1. Appoint one spokesperson (usually a family member) who is the person who deals with the doctors and nurses and then passes the updates on to others.
2. Write down a list of your questions or concerns and leave it with the nurse in charge. Ask when someone will be available to discuss these with you or when you can expect a written response to your concerns.
3. If things are particularly hectic on the unit, it may be best, if possible, to keep your distance or go for a cup of coffee and come back later when the situation has settled.
4. If an emergency involves your loved one, ask staff what they would like you to do. They may welcome your help or they may suggest that you leave until the emergency is dealt with.
5. Show your appreciation when someone makes an effort on your behalf. It is human nature to respond favorably and cooperatively when someone acknowledges their efforts and contributions.

Physicians and specialists may be the most difficult people to track down because they usually have very demanding schedules. Even when you have been able to catch up with them, it may be that they must rush away with many of your questions and concerns

unanswered. Here are some suggestions for the times when you have issues that only the physician or specialist can address:

1) Again, write out a list of your concerns. This will give you a rough idea of how much time you will need with the physician and you will be less likely to forget to raise important questions as often happens when feeling stressed or upset.
2) Ask the physician when he/she will be available to meet with you. Your schedule will probably be more flexible so try to arrange a time at his/her convenience. It may mean that you arrive at the hospital at odd hours but you will be more likely to get his/her undivided attention.
3) If the physician or specialist will be away or is unavailable when you need them, ask who will be replacing him/her or who else you can contact regarding urgent concerns.

Many of the above suggestions can apply in both the critical and acute care settings. For further assistance call NABIS.

Surviving the Affects on the Family

When a loved one has sustained critical injuries, family member's lives can be turned upside down in a matter of seconds. The initial reaction is usually shock, combined with fear for the survival of the loved one. When severe injuries have occurred, it may take days, weeks or even months to stabilize the physical conditions which brought a loved one into the emergency room. Family members of a seriously injured loved one later look back on these events and often don't recall much of the critical phase of recovery. Days seem to blur together, and a sense of confusion and memory loss is commonly experienced. This state of shock varies in duration and intensity and can serve as a protection against a reality which is too overwhelming to accept so suddenly. It is generally best to allow each family member to work through this at his/her own rate.

Once it is clear that the person with injury is going to survive, it is often a challenge to balance the need for hope and faith in recovery, with a realistic picture of what the consequences of injury will be. At the critical/acute stage it is most difficult to predict the

long-term effects of injury. Yet, it is clearly hard on everyone, especially the person with brain injury, to have expectations that are overly ambitious. Hope is important for the person with injury and family members but it is more useful to everyone to emphasize the recovery that has occurred and to try to make the recovering person feel worthwhile, even though he/she has not met hopes and expectations. Make your motto "one day at a time".

Facing the outcome of a serious injury and the possibility that your loved one may not be exactly as he/she was before, may open the floodgates to feelings of fear and rage. Anger and resentment at the unfairness of the situation may be directed at several targets or it may be a particular person or situation that sets you off. Overwhelming fear and anger are normal reactions in desperate circumstances. However, if one allows these feelings to fester and then become unleashed upon an unsuspecting person, relationships can be damaged with people who would otherwise be important allies in the care and concern for your loved one. If channelled into meaningful activity and used constructively, much good can be accomplished. It can be most helpful to stay aware of such feelings, talk about them with others who are key to the current situation and try to help them understand.

It is also important to note that a severe brain injury in the family can place the family unit under a great deal of stress. At the height of anxiety, people can say or do things that are out of character and the ongoing stress can place a great strain on relationships. As the days and weeks pass, you may encounter differences of opinion regarding the care/ treatment you think your loved one should be receiving. A step-parent may have difficulty relating to the natural parent's compelling need to be with an injured loved one. Other children may not be able to understand the demands the situation has placed on the family, they may feel guilty about asking that their own needs be met or they may begin to misbehave as a way of getting your attention. In the weeks or months since the injury has occurred, your world has likely revolved around this crisis, everyday life has been put on hold. It is important to remember that life is still going on around you. If there are children in the family, they may need attention now more than ever. Bills must be paid, laundry done, etc. and the injury may necessitate changes in family structure or family roles.

You may find yourself uncomfortable with the emotional reactions or feel as though you're not "getting over" these things as well as you could. At the same time, it may seem as though family problems are beginning to mount on top of an already distressing situation. You are not alone in your experience. It is very difficult for most families to make the necessary adjustments and you may find the support of a counsellor useful. Many family members have also reported that participation in a family

support group with other families who have had similar experiences provided much needed information, support and helpful insights. Call NABIS for more information.

Some family members have found that keeping a journal/visitor log during this time has helped them keep track of progress and events as they develop (eg. avoid confusion, what happened, who said what and when, etc.). Keeping notes has also allowed them to keep track of concerns and questions, identify things that were helpful, and record feelings, worries and struggles. In the end, a journal can be useful in maintaining perspective and making sense of unfolding events. A photo journal is also helpful as it documents the changes for the individual with injury.

Legal Considerations for Families

Some injuries may necessitate legal representation with regard to the cause of the injury to your loved one. It may appear that there is no need for a lawyer or that you have little reason to, or interest in pursuing legal matters at this time. However, it can be important to have legal advice on matters in which you have rights that may not be readily apparent. Most lawyers will provide an initial consultation at no charge and can determine whether seeking litigation is advisable. It is important that you choose a personal injury lawyer who has extensive experience with brain injury and whose case load does not represent a possible conflict of interest to you. Where legal matters are in question, a lawyer should be consulted as soon as possible while the situation is still fresh. Further information as to the issues to consider when choosing legal counsel can be obtained from NABIS.

Glossary of Terms

When discussing medical conditions, procedures, treatment plans and recovery progress members of the medical team will often make use of unfamiliar clinical terms. The following list provides definitions of some of the terminology frequently used by health care practitioners. The glossary is not exhaustive and provides only a brief explanation of terms. An asterix(*) is placed beside terms that are discussed in previous pages of this guide. If the explanations leave you wanting for more information, you can feel free to contact a member of the health care team or NABIS with your request.

ABI Acute Care Coordinator	Professional within the acute care system who assists individuals and family members to understand the process of hospitalization and transition toward rehabilitation and/ or integration back to community
ABI Case Manager	Professional within the medical system who assists with accessing resources, provides general education about brain injury and assist with the integration process back to community life.
aneurysm*	a weak section in an artery wall. Immediate treatment is required if pressure from blood flow causes the aneurysm to balloon out and perhaps even rupture.
anoxia*	occurs when blood flow to the brain is reduced, depriving the brain of oxygen and causing damage.
arterial (Art) line	a tube inserted into the arm that directly measures arterial blood pressure as well as the concentration of oxygen and carbon dioxide in the the blood.
anterograde amnesia	the inability to remember events after the occurrence of injuries - essentially, an inability to learn. The amnesia is usually not complete but patchy, with some things being recalled and others not.
anti-convulsant medication	medication that prevents the occurrence of convulsions or seizures (diazepam, tegretol).
aspiration	the breathing of foreign materials into the airways.
aspirator	a device for suctioning unwanted matter from the air passage.
atrophy	in the medical setting, the term usually refers to the deterioration of muscle tissues due to lack of use. The term may also be used with reference to the deterioration of brain tissue.
brain stem	the lower segment of the brain connecting it to the spinal column. It is responsible for many of the body's vital operations such as blood pressure, pulse and breathing.

burr holes*	holes made in the skull using a special surgical drill. Burr holes may be initiated to drain a hemorrhage or as the first step in performing a craniotomy.
CAT or CT Scan* (Computerized Axial Tomography)	a technique using x-rays in combination with computer technology. The readings are fed into a computer which calculates tissue densities, brain, bone and fluid deviations so that the doctor can check for abnormalities.
catheter	a flexible plastic tube used to carry fluids away from or into the body.
central venous pressure (CVP) line	a catheter inserted into one of the veins to allow direct measurement of venous blood pressure (the pressure of the blood as it goes into the heart). The CVP lines are inserted into arm, chest or neck and are connected to a monitor.
cerebellum*	concerned with coordinating balance and movements and is the brain segment located just below the cortex or cerebrum.
chest tubes	these are inserted to drain an accumulation of air or fluids from the chest cavity. Whereas the lungs can collapse from an accumulation of air and fluids, keeping this area clear allows the lungs to expand more fully.
coma / comatose*	a state of unconsciousness where the individual is unresponsive to stimulation and lacks awareness of his/her surroundings.
concussion	a mild injury to the brain causing a temporary loss of consciousness.
contractures*	shortening of muscles from disuse which makes them resistant to stretching and can lead to deformity.
contusion	bruising of brain tissues.
cortex/cerebrum*	the large part of the brain that rests on top of the cerebellum. It is divided into tow hemispheres and is responsible for our voluntary functions such as thinking, memory and motor activities.
coup or contrecoup injuries	when brain tissue is injured just below the site of impact it is referred to as a coup injury. When the brain hits the skull and then bounces against the other side of the skull causing multiple contusions, it is called a contrecoup injury.
CVA	Cerebral Vascular Accident - see stroke
craniotomy	surgery that involves incisions to open the skull and create a flap that can be lifted so as to expose the brain, allowing the surgeon to work on it.
decerebration	an abnormal posture occurring in the unconscious person in which all of the limbs are rigidly extended.

disorientation being unaware of who you are or where you are in time and space. Clinicians sometimes use terms such as “oriented in all three spheres” or “oriented three times”, meaning the awareness of person, time and place.

edema the presence of an abnormally large amount of fluid. When occurring around the brain it is referred to as cerebral edema and is usually caused by brain trauma, anoxia or tumor.

electroencephalogram (EEG) small pads placed on the skull from which wires measuring brain activity are connected to a monitor.

electrocardiogram (EKG) three small pads placed on the chest and connected to a monitor that measures heart rate and rhythm. It is used routinely in intensive care.

endotracheal tube (E.T. tube)* a tube inserted through the mouth or nose that serves as a artificial airway. Since it passes through the throat and the vocal cords, the patient will be unable to speak as long as it is in place.

flaccidity a clinical term used to describe reduced muscle tone which causes limpness. Muscle tone is the resistance of a muscle to being stretched. When nerve damage occurs in the brain or spinal cord, the flow of information that allows muscles to ‘know’ how much tension to release or maintain in the muscle is disturbed.

foley catheter a tube inserted into the urinary bladder to drain the urine.

Glasgow Coma Scale* a clinical rating scale with a range of 3 to 15 that measures level of consciousness based on eye opening, motor response and verbal response.

halo brace a metal ring used to align and stabilize the head and neck when a spinal cord injury has occurred.

haematoma* an abnormal collection of blood. Cerebral haematoma is such a formation within the skull occurring either inside or outside of the brain tissue. There are several types:

hemiparesis occurs when injury to the areas of the brain that control motor functions create weakness on one side of the body or part of it.

hemiplegia occurs when injuries paralyze muscles on one side of the body.

hemorrhage* internal bleeding that occurs when blood vessels inside the skull or brain have been damaged.

incontinence the inability to control the functions of the bladder or bowels.

infarct an area of tissue that is dead due to insufficient blood flow. It often results from the blockage of an artery by a clot.

Internist	A physician who specializes in the diagnosis and medical treatment of adults. This specialty, called internal medicine, is dedicated to adult medicine. Sometimes called a General Practitioner
Intracranial Pressure (ICP) monitor*	a monitor used to measure pressure inside the skull. It consists of a small tube that is attached to the skull and then connected to a transducer.
intravenous line*	a narrow tube (sometimes referred to as a catheter) inserted into a blood vessel.
Lab/X-ray Technicians	Medical staff who perform test or assessments for the purpose of understanding a person's medical health status.
meninges*	the layers of tissue that line the skull and protect the integrity of the cerebrospinal fluid and the brain.
MRP (Most Responsible Physician)	The physician who takes primary responsibility for the individual while in the acute care system. This is usually the General Practitioner but not always.
nasogastric or NG tube*	a tube fed through the nose and down into the stomach.
Neurologist	A doctor who specializes in the diagnosis and treatment of disorders of the nervous system
Neuropsychologist	A psychologist who has completed special training in the neurobiological causes of brain disorders, and who specializes in diagnosing and treating these illnesses using a predominantly medical (as opposed to psychoanalytical) approach.
Neurosurgeon	A physician trained in surgery of the nervous system and who specializes in surgery on the brain and other parts of the nervous system. Sometimes called a "brain surgeon."
OT - Occupational Therapist	health professionals who help people or groups of people of all ages assume or reassume the skills they need for the job of living. Occupational therapists work with their clients to help them identify barriers to meaningful occupations (self care, work and leisure).
paraplegia	muscle paralysis to the lower half of the body.
Physiatrist	A physician specializing in physical medicine and rehabilitation. Physiatrists specialize in restoring optimal function to people with injuries to the muscles, bones, tissues, and nervous system
Physical Therapist	A person trained and certified by a state or accrediting body to design and implement physical therapy programs. Physical therapists may work within a hospital or clinic or as an independent practitioner.
Psychiatrist	A physician (an M.D.) who specializes in the prevention, diagnosis, and treatment of mental

	illness. Psychiatrists must receive additional training and serve a supervised residency in their specialty. They may also have additional training in a psychiatric specialty, such as child psychiatry or neuropsychiatry.
post traumatic amnesia	lack of orientation to and recall of events, time and space since onset of the injuries. PTA may take anywhere from a few hours to several months to resolve and is sometimes used as an indicator of severity of brain injury.
pre-morbid	a person's condition before the occurrence of injury or disease.
prognosis	prediction of the probable course of a disease or recovery from injuries.
quadriparesis	a weakness of all four limbs that are not paralyzed.
quadriplegia	muscle paralysis that has affected all four limbs.
RN - Registered Nurse	A nurse who has completed a two- to four-year degree program in nursing, and provides direct patient care for acutely or chronically ill patients.
Respiratory Therapist	A person who has graduated from an approved respiratory therapist program and is qualified to provide respiratory care under the supervision of a physician.
respirator/ventilator*	a machine that provides moist air and moves it in and out of the lungs at the proper rate and with the required percentage of oxygen. The respirator is used when an individual's natural abilities to breath with proper regulation have been compromised.
retrograde amnesia	loss of memory for events preceding the injury. It is not usually complete but rather, some things may be remembered while others are not.
shunt	a mechanical device used to drain excess fluid from around the brain.
skull fracture*	cracking or breaking of the bones of the skull. Some types that may be referred to include:
linear fracture	a simple break that causes no shift in the bones or shape of the skull.
comminuted fracture	several linear fractures that occur at the same time.
depressed fracture	a displacement of bone that forms an indentation in the skull. It usually results when a comminuted fracture has caused bone fragments to fall inward.
compound fracture	any of the above types of fractures combined with an external opening (e.g. ear drum, sinuses).
basal skull fracture	a break in the bones at the base of the skull.

Social Worker	Professional with a 4 year degree or greater who is committed to address and resolve social issues and to enhance the quality of life for individuals in social crisis.
spasticity*	an abnormal increase in muscle tone which causes muscles to become stiff and resist being stretched.
space boots and	these padded support devices are designed to align the
wrist splints	muscles and tendons so as to prevent the development of deformities that may limit future movement.
Speech-Language Pathologist	A specialist who evaluates and treats communication disorders and swallowing problems A speech-language pathologist is sometimes called a speech therapist or speech pathologist.
subarachnoid screw or bolt	a measuring device which rests on the surface of the brain.
stroke	also known as a cerebral vascular accident, occur when blood flow to a region of the brain is obstructed and may result in death of brain tissue.
Swan-Ganz catheter	a catheter similar to the central venous pressure (CVP) line. It enables the measurement of blood pressure not only in the right side of the heart (as the CVP line does) but also in the lungs and the left side of the heart. It may be used alone or along with a CVP line.
tracheostomy*	a procedure that involves making a small, temporary opening at the throat into which a tube is inserted. It is usually done to ensure airways are sufficiently clear to supply needed oxygen without undue harm to the throat or vocal cords.
ventricles*	brain cavities containing cerebrospinal fluid which function as cushions that absorb shock from impact to the brain. The ventricles may enlarge when tissue damage has occurred or if the flow of cerebrospinal fluid is impeded. This can result in a condition known as hydrocephalus.
ventriculostomy	a surgical procedure involving the placement of measuring device into one of the fluid-filled chambers of the brain.

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Contributors:

Doug Rankmore MA

Susan Volkmann MSW

Stacie Ziemer, BSW

Elizabeth Ruppel, RN

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For local and provincial information on brain injury services please visit www.nabis.ab.ca

BRAINTRUST
CANADA

11-368 Industrial Ave. Kelowna BC V1Y 7E8
T 250.762.3233 | F 250.861.3008
info@braintrustcanada.com | www.braintrustcanada.com