# FACTS AND INFORMATION

## About the Brain

The brain is divided into different sections and each section controls different functions of the body. The functions of the body that will be affected as a result of a brain injury, will depend on which part of the brain has been injured.

The brain can be divided lengthways into two halves, known as the left and right cerebral hemispheres.

The left hemisphere processes information in a manner that is sequential and logical. That is, it will arrange information, step by step, into a sequence or logical order. The left hemisphere is involved with language, speech, mathematics and reasoning.

The right hemisphere functions in a manner that is holistic and is concerned with the whole or 'big picture', rather than separating the information into parts. It is concerned with non-verbal information and visual, auditory and sensory perception.

Each cerebral hemisphere is divided into four lobes.

Frontal Lobe
The frontal lobe is located under the forehead. It controls our cognitive functions (perceptions, thinking and remembering), awareness of environment, language use, emotional responses, making judgements and problem solving.

Injury to the frontal lobe can cause
• Impairment to concentration and attention
• Impulsive behaviour and mood swings
• Lack of inhibitions, leading to socially inappropriate behaviour
• Difficulty or inability to plan and complete a sequence of actions
• Loss of simple movement of body parts, known as paralysis
• Persistence with a single action or thought
• Diminished reasoning skills.

Parietal Lobe
The parietal lobe is located behind the frontal lobe and above the

occipital lobe. It is concerned touch perception and body awareness. It concerns consolidating our sensory perceptions to recognise objects. It directs voluntary movements of the body and object manipulation.

Injury to the parietal lobe can cause
• Inability to name objects and write words
• Impaired reading and drawing skills
• Impaired hand-eye co-ordination
• Difficulty in focussing visual attention
• Difficulty with mathematics
• Diminished awareness of body parts and the environment
• Difficulty in attending to more than a single task at one time
• Difficulty in discerning the left from the right

Occipital Lobe
The occipital lobe is located at the back of the head. It primarily controls vision and recognition of colour.

Injury to the parietal lobe can cause
• Impaired ability to locate objects
• Impaired ability to identify colours
• Visual illusions, whereby objects are seen inaccurately
• Difficulty in recognising words and drawn objects
• Inability to recognise movement of an object

Temporal Lobe
The temporal lobe is located at the side of the brain. It is primarily concerned with auditory stimuli (hearing). It also concerns memory, categorisation of objects, behaviour and some visual perception.

Injury to the temporal lobe can cause
• Diminished ability to recognise faces
• Diminished ability to recognise spoken words
• Difficulty identifying and naming objects
• Short-term memory loss
• Diminished ability to categorise information
• Changes in emotions and sexual behaviour.

## Causes of Acquired Brain Injuries

ABI primarily occurs as a result of a closed or open head injury.

A closed head injury occurs when the head forcefully strikes an object and there is no penetration of the skull. Such injury may occur in a motor vehicle accident, sporting accident or fall etc.

An open head injury occurs when an object penetrates the skull and directly injures the brain.

Damage to the brain can also result from :

- Chemicals or toxins damaging neurons
- A lack of oxygen. This can result from anoxia, where there is no oxygen or hypoxia, where there is reduced oxygen
- Tumors
- Diseases including AIDS, Parkinson's disease, Alzheimer's disease
- Stroke

## The Effects of Acquired Brain Injuries

The effects of an acquired brain injury will depend on the nature and severity of the injury. The effects will vary with individuals with similar injuries having differing effects.

As the brain controls the functions of the body, damage to the brain can have a profound effect. An acquired brain injury can affect a person's physical, emotional and cognitive capacity.

Cognitive
The process of acquiring knowledge including perception, thinking, remembering, intuition and reasoning is known as cognition.

The impairment of a person's cognitive skills can have a profound impact upon their memory and their ability to communicate and concentrate. This will inevitably impact upon a person's independence. They have problems with planning, organising and

reasoning and therefore their ability to solve problems will be diminished.

It is important to remember that a person with ABI retains their intellectual capacity but due to the impairment of their cognitive skills, they have difficulty communicating.

Memory

An individual will often retain their long-term memory, remembering things and events that occurred prior to the injury. A person may have difficulty with memory for new information. They may experience problems with common day to day things including people's names, recent events and conversations.

It is important to develop strategies for people who have memory difficulties. This will improve their ability to manage their memory for day to day activities and reduce the stress and anxiety associated with their inability to remember.

Keeping information and events in calendars, diaries and notebooks will assist in recalling information. The use of watches and timers will also be useful.

General memory strategies (that can be used by all individuals to improve memory) include repeating information several times and using visual aids.

Concentration

A person may experience poor concentration. They may have difficulty concentrating, become easily distracted, experience problems focussing on what is important or shifting their focus.

Consequently, people can become frustrated and confused.

It is important that a regular routine is adopted and that distractions are minimised. It is necessary for people, such as friends, family, care providers, co-workers or teachers to be aware of a person's difficulties. Such people can assist in improving concentration skills and ensure that individuals maintain social interaction.

Language skills
People with ABI can experience difficulty with their language abilities. They can have difficulty organising their thoughts, with word finding and may be slow to respond.

Physical
People with ABI may also experience impairment of their physical abilities.

A person may experience dysarthria, where their speech may be slow and slurred. If severe, they may be extremely difficult to understand.

They may experience dizziness, headaches, problems with balance and fatigue. They may experience pain in the head or other affected areas of the body. Individuals can often have problems with vision and hearing.

Paralysis can also effect a person and it can vary in its severity from weakness in part of the body to being paralysed.

Emotional problems
An ABI can have a profound impact on a person's emotions and behaviour. Difficulties with emotions are often associated with the problems a person experiences with their cognitive abilities.

A person who is having problems with attention (a cognitive skill) can become restless, agitated and frustrated.

A person with ABI can also experience emotional liability. They have problems controlling their emotions, crying, laughing or becoming angry easily or at times that is inappropriate.

Diminished insight is also experienced by people with ABI, however, it can be very difficult to overcome. They have difficulty understanding their limitations, changes in their abilities and the impact on their life.

Due to their cognitive difficulties, individuals can also become impulsive or exhibit socially inappropriate behaviour. They are

unable to properly assess a situation and are less inhibited. Their behaviour may be inappropriate in what they say or how they act.

Depression

Depression is a common issue for people with ABI. An ABI can have a profound impact on a person's body, abilities and emotions, which will in turn affect their day to day life and their relationships.

The severity of their injury, the impact on their day to day life, the level or recovery will all play a part in a persons' level of depression.

Depression can compound difficulties that already exist and impact upon recovery. It is important that the issue is acknowledged and treatment, whether it is medication or counselling or both, is considered and adopted.

## Treatment of Acquired Brain Injuries

When a person suffers a brain injury, it is vital that they receive medical treatment.

Medical care will often commence when paramedics treat the individual or when the individual arrives at the emergency department of a hospital. Once hospitalised, medical staff will make an initial diagnosis, stabilise the patient and arrange for appropriate treatment.

Medical staff will stabilise the individual by ensuring that they have assistance with their breathing and respiration.

Diagnosis

Medical staff will asses the individual's condition by checking a range of factors including their pulse, blood pressure and

temperature. A range of diagnostic scans will be undertaken to determine the patient's condition.

**X-Rays** are used in medicine for imaging bones and used to detect bone fractures. **Computed tomography (CT)** uses x-rays to scan the head and generate cross-sectional images of the brain. **Magnetic Resonance Imaging (MRI)** uses magnetic fields to scan the brain. It generates an image that provides information on soft tissue structures, such as the brain, and can show changes to the living tissue.

An individual with a brain injury may have injuries to other areas of their body, and all of these injuries will need to be attended to.

**Spinal cord**
A person with a brain injury may have also suffered an injury to their spinal cord. They may be placed on a back board and a neck restraint may be used to limit movement.

**Brain swelling**
A head injury can cause the brain to swell inside the skull. When this occurs, there is no room for the expanded or swollen tissue and the extra fluid is not absorbed. This results in increased pressure known as intracranial pressure.

It will be necessary to insert a tube in order to measure the brain swelling. Medical practitioners will employ methods, such as the use of drugs, to reduce this pressure.

**Coma**
A person who has suffered a brain injury may also be in a coma. A coma is a loss of consciousness, whereby a person cannot be aroused, cannot respond or communicate.

Medical practitioners will asses a person's level of consciousness according to the Glasgow Coma Scale. They will assess their response to stimulation, ability to speak and open their eyes.

A person in a coma will be closely monitored by medical staff. The length of time that a person can be in a coma will range from

minutes to days, or even months or years. The process of coming out of a coma is a slow and gradual one. A person who comes out of a coma may suffer from post-traumatic amnesia (and will suffer from loss of memory).

## Treatment

Once an initial diagnosis is made, appropriate treatment, including surgery, can be considered and then undertaken. A patient may be transferred to an operating room for surgery, to intensive care or to the neurosurgical ward.

Surgery may be required for a number of different reasons. It may be necessary for hematomas, contusions, to remove bone fragments or for inserting a tube to reduce brain swelling.

A person may need to receive treatment and monitoring in the intensive care unit or ICU. They may be unconscious or require assistance with their breathing. A person may need to receive treatment in the neurosurgical ward. Neurosurgeons are medical practitioners who specialise in brain injuries and spinal cord diseases and injuries.

The nature and extent of further treatment for a particular person will depend on the nature and severity of the injury sustained.

A person may undergo treatment with various medical providers such as occupational therapists, speech pathologists, physiotherapists, psychologists and neuropsychologists. The aim of this treatment is primarily to rehabilitate the individual to increase their ability to function at home and in the community.

These medical specialists can assist the person to improve their functional capacity, adapt to their disability and modify their home and work environment to accommodate any impairments they may have.

A range of factors will determine a person's level of recovery, including the nature, location and extent of the injury, the person's general health and time in which receive medical treatment.

In time, the patient will be discharged from the hospital. They will often be given a rehabilitation plan, medication and be referred to local rehabilitation services. Prior to being discharged, nursing requirements should be identified and necessary modifications to the home should be made.

The individual will return to the hospital or hospital clinic as an outpatient, continuing to see medical specialists for treatment, rehabilitation and review.

Families and Friends

For families and friends, this can be an emotional and overwhelming experience. It is important to identify the various medical staff such as the neurosurgeon and nurses, who are involved in the treatment of the individual. Such staff can respond to queries and concerns that family and friends may have.

It is necessary to understand the advice of the medical staff. Families will already be overwhelmed by this difficult situation. Medical staff may use medical jargon that is difficult to understand. Families who cannot understand the advice of medical staff should ask for them to repeat what they have said in clear and simple language.

Caregivers such as family and friends will also need training to ensure that they understand the how they will be required to assist in rehabilitation.

## About Acquired Brain Injuries

Acquired Brain Injury or ABI refers to any type of brain damage that occurs after birth. It does not include any congenital or

hereditary problems. The term ABI is used interchangeably with head injury or acquired brain damage.

As the brain is an important organ which controls the body, an injury to the brain can have a considerable impact on various aspects of a person's body.

Symptoms of brain injury may be immediately apparent or may appear gradually.

The effects of a brain injury will vary and will depend on the nature and degree of the actual injury. Ranging from mild to severe, the effects of a brain injury are also hard to estimate. The level of recovery will vary according to each injury.

## Glossary of Terms Relevant to Acquired Brain Injury

**Adynamia:** loss of strength and difficulty initiating activities, caused by an injury to the frontal lobes.

**Ageusia:** lack of or reduced sense of taste.

**Agnosia:** loss of ability to recognise familiar object or people.

**Agraphia:** loss of the ability to write as a result of injury to the brain.

**Alexia:** impaired ability to read.

**Alzheimer's Disease:** degenerative disorder of the brain resulting in the decline of the physical and mental abilities.

**Amnesia:** loss of the ability to recall information from memory.

**Anoxia:** lack of oxygen in tissues or organs, such as the brain.

**Aphasia:** loss of the ability to communicate in speech or writing as a result of an injury to the brain.

**Apraxia:** loss of the ability to perform purposeful muscular movements as a result of damage to the brain.

**Ataxia:** loss of muscular co-ordination causing abnormal movements.

**Auditory:** of or relating to hearing.

**Brain stem:** the lower extension of the brain that connects to the spinal cord. Breathing, heart rate and alertness are controlled by the brain stem.

**Catheter:** a long tube which inserts into a part of the body allowing for the introduction or withdrawal of fluid to or from the body.

**Cerebellum:** located towards the back of the brain, it is the part of the brain which co-ordinates voluntary movement.

**Cerebral:** of or relating to the brain.

**Cerebro-spinal fluid (CSF):** clear liquid which fills the spaces in and around the brain and spinal cord.

**Cognitive:** the intellectual function of acquiring knowledge by perceiving, thinking, remembering and reason.

**Coma:** loss of consciousness, whereby a person cannot be aroused and cannot respond or communicate.

**Contusion:** bruising of the brain.

**Craniectomy:** surgical removal of part of the skull.

**Craniotomy:** surgical incision into the skull to allow access to the brain.

**Computed tomography (CT scan):** uses X-Rays to scan the head and generate in cross-sectional images.

**Diffuse brain injury:** injury to cells in several areas of the brain instead of one location.

**Disinhibition:** loss of inhibition, lack of control over speech or actions.

**Dysarthria:** difficulty in speaking caused by damage to the brain.

**Dysgraphia:** loss of ability to write correctly.

**Dysphia:** difficulty swallowing.

**Dyspraxia:** see apraxia.

**Echolalia:** repeating sounds or words without comprehension and can occur from brain damage. It is usual in infant children who are learning, but it is unusual in adults.

**Electroencephalogram (EEG):** this test records changes in electrical activity in the brain.

**Epilepsy:** periodic loss of consciousness with convulsions or seizures of part or all of the body.

**Focal brain injury:** injury to the brain that is restricted to one location.

**Frontal lobe:** part of the brain that is located under the forehead. It controls cognitive functions (perceptions, thinking and remembering), awareness of environment, language use, emotional responses, making judgements and problem solving.

**Glasgow Coma Scale:** measure the level of consciousness after trauma or injury.

**Haematoma:** a clotting of blood.

**Hemianopia:** loss of vision in the same side of both eyes, which can cause an inability to see things on the left or right side.

**Hetrotopic ossification:** abnormal deposits of bone in muscle.

**Hydrocephalus:** enlargement of ventricles due to accumulation of cerebro-spinal fluid.

**Impulsivity:** rushing into something without careful thought.

**Intra cerebral haematoma:** blood clot in the brain caused by trauma.

**Intracranial pressure:** pressure inside the skull.

**Intracranial pressure monitor:** device to monitor pressure within the brain.

**Magnetic Resonance Imaging (MRI):** uses magnetic fields to scan the brain. It generates an image that provides information on soft tissue structures, such as the brain, and can show changes to the living tissue.

**Neurology:** study of the anatomy and the nervous system.

**Neuropsychologist**: studies changes in thinking and behaviour that may be caused by brain injury or dysfunction and assist with assessment and rehabilitation

**Neurosurgeon:** surgeon who specialises in surgery relation the nervous system (brain injury, spinal cord diseases and injury).

**Occipital lobe:** part of the brain that is located at the back of the head. It primarily controls vision and recognition of colour.

**Occupational therapist:** specialist who assists a person to overcome limitations that may have been caused by injury or illness in order for that person to participate and complete activities in day to day life.

**Oedema:** accumulation of fluid in the brain, causing swelling.

**Parietal lobe:** part of the brain that is located behind the frontal lobe and above the occipital lobe. It is concerned with touch perception, recognising objects. It directs voluntary movements of the body and object manipulation.

**Perseveration:** persisting with a single thought or action and not being able to move onto a new thought or action when required (for a new or different task).

**Post-traumatic amnesia:** period after being in a coma. There is often confused behaviour and loss of memory.

**Proprioception:** sensory awareness of the body parts whether or not there is movement.

**Shunt:** a procedure whereby a surgically placed tube channels excess fluid from the brain into either the abdominal cavity, heart or large veins of the neck.

**Spasticity:** increase in muscular tone.

**Speech pathologist / Speech Therapist:** specialist who assesses and treats people who have swallowing and communication problems.

**Temporal lobe:** part of the brain that is located at the side of the brain. Concerns hearing, memory, categorisation of objects, behaviour and some visual perception.

**Tracheostomy:** surgical formation of an opening into the trachea to insert a breathing tube through the middle of the neck. Adequate air passage can be maintained through the neck.

**Ventilator:** a device that does the breathing for a person who is unable to breathe, providing the appropriate amount of oxygen or pressure.

**Ventricles:** cavities (spaces) inside the brain that contains cerebro-spinal fluid.