BRAIN INJURY SERIES

HEADWAY
Brain Injury Services & Support

The brain
and brain injury

IN THIS BOOKLET:

- The nervous system and the brain
- Parts of the brain and what they do
- Types of brain injury
- Effects of a brain injury
- Sources of help and information

Brain Injury Series

This booklet was written for, and with, people with an Acquired Brain Injury and their family members. Our sincere thanks to everyone who contributed.

An Acquired Brain Injury is an injury to someone's brain that happens during their lifetime. It can be caused by a stroke, an infection, lack of oxygen, surgery or a head injury, for example. Throughout this booklet, we use the phrase 'brain injury' to refer to an Acquired Brain Injury.

If you have any feedback on this booklet, or would like further information or support, contact us on t: 1890 200 278, 01 6040 800 or e: info@headway.ie. Visit www.headway.ie/information to see our sources and contributors. You can also read, download or request copies of other booklets in this Brain Injury Series.

Please note: we have done our best to provide information that is correct and up-to-date. However, we cannot be responsible for any errors or omissions. Everyone's brain injury affects them differently. You should not consider the information in this booklet as a substitute for getting advice from a doctor or other professional.

Booklet concept and content development:
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See headway.ie/information for further details.

Contents:

What the symbols mean:

Key points about the brain and brain injury

Where to get more help and information

Introduction

This booklet is aimed at people with brain injuries and their family members. We have done our best to use easy-to-follow information and clear diagrams.

We hope you find the booklet useful and informative. We welcome your feedback.

This booklet includes:

1. An overview of the nervous system and the brain.
2. Types of brain injury
3. Effects of a brain injury
4. Where to get more information or support.

You can get advice, tips and information on living with the effects of a brain injury from the other booklets in the **Brain Injury Series**. We also have a **Family Guide to Brain Injury** aimed at the friends and family of people affected. See page 38 for a list of booklets and how to get them.

If you would like further information or support, see page 37 for how to contact Headway and other useful organisations.

An Acquired Brain Injury (ABI) is any sudden damage to the brain that occurs during a person's lifetime. It can be caused by a stroke, an infection, lack of oxygen, surgery or a head injury, for example. Throughout this booklet, we use the phrase 'brain injury' to refer to an Acquired Brain Injury.

The Nervous System and the Brain

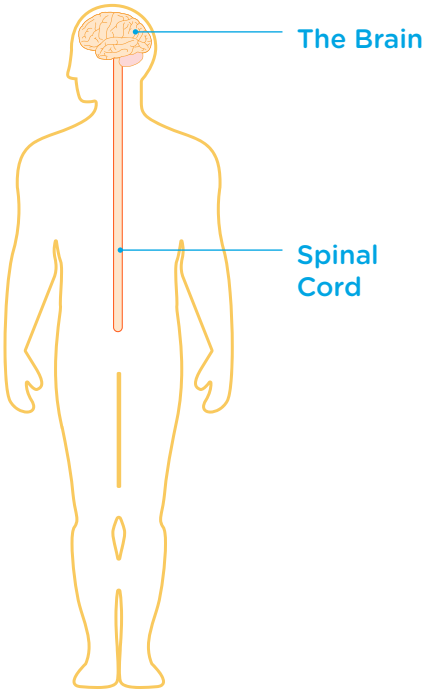
The Nervous System

The Nervous System is the body's communication and coordination network. It is made up of billions of nerve cells known as neurons. The role of the nervous system is to help coordinate everything that we do. The brain is a very important and complex organ in our nervous system.

The nervous system is divided into two main parts that work together — the Central Nervous System and the Peripheral Nervous System.

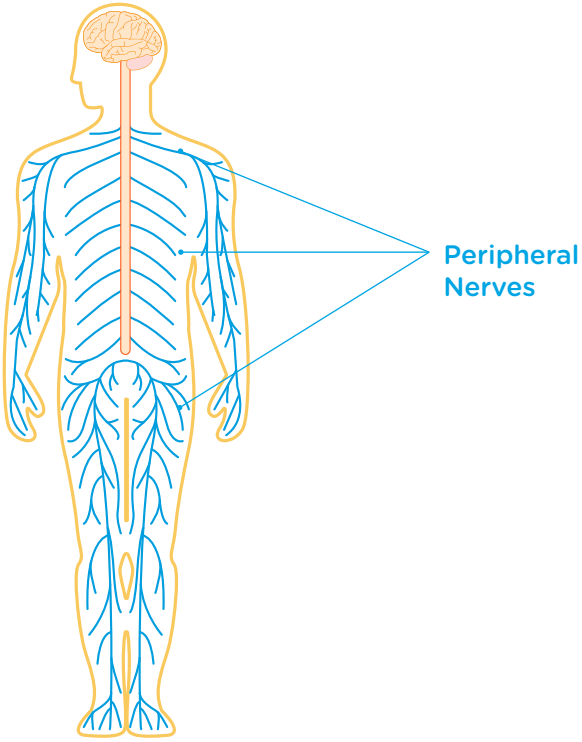
The **Central Nervous System** is made up of the brain and spinal cord. They work together like a control centre which sends and receives messages to, and from, the rest of the body.

The Central Nervous System



The **Peripheral Nervous System** allows us to control our muscles. It also controls vital body systems such as our heart rate and breathing.

The Peripheral Nervous System

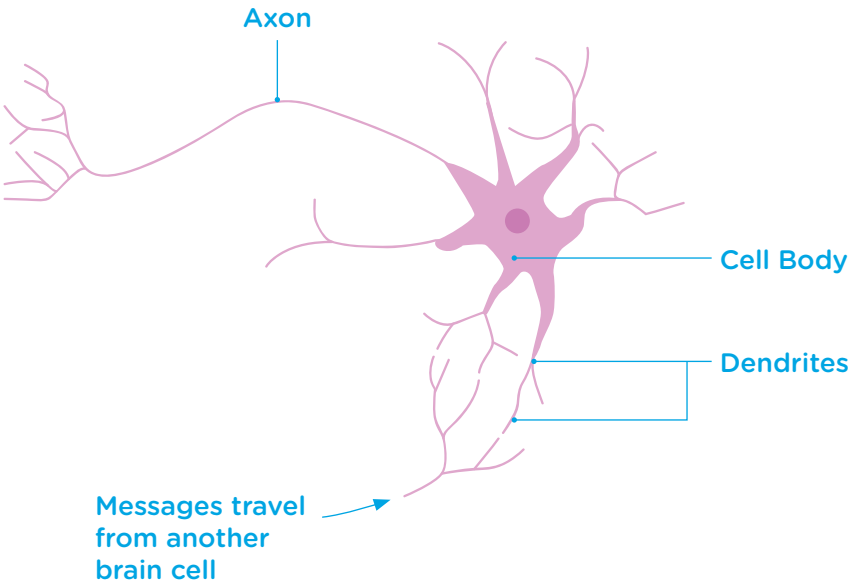


Nerve Cells (Neurons)

There are about 100 billion nerve cells in the human brain. They communicate with each other through electrical and chemical messages. In this booklet, we refer to nerve cells in the brain as 'brain cells.'

Each brain cell has a cell body, a long fibre called an axon and extensions called dendrites. **The Dendrites** bring messages to the cell body. The **Cell Body** processes the message and the **Axon** takes information away from the cell body. This system allows brain cells to communicate with each other.

A Brain Cell



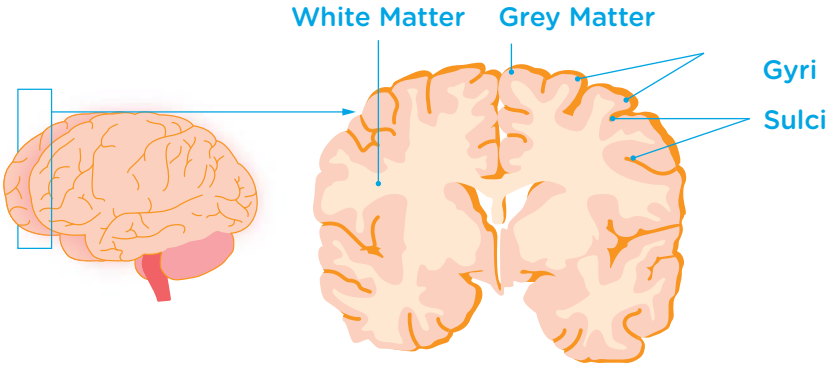
The Brain

The brain controls and coordinates everything we do. Its job is to receive messages, process those messages and respond to them. The brain allows us to do a huge range of things such as think, learn, move, breathe, speak, show emotion and control most of our bodily functions.

What are Grey Matter and White Matter?

The brain is made up of two types of tissue - Grey Matter and White Matter. **Grey Matter** is mainly made of brain cell bodies and dendrites. Its role is to process information. Grey matter is mainly found in the surface layer of the brain.

White Matter lies underneath the grey matter in the brain. White matter is made of the long brain cell fibres that carry messages to, and from, the grey matter. The grey matter and white matter work together to allow us to carry out the things we do on a daily basis.



Why does the brain's surface have wrinkles?

As humans evolved as a species, our brains grew larger to accommodate all the functions that set us apart from other animals. In order to create space for more grey matter, our brains developed many wrinkly folds called **Sulci** and **Gyri**. This increased the surface area of the brain and allowed more space for brain cells.

The Brain's Protection and Support Systems

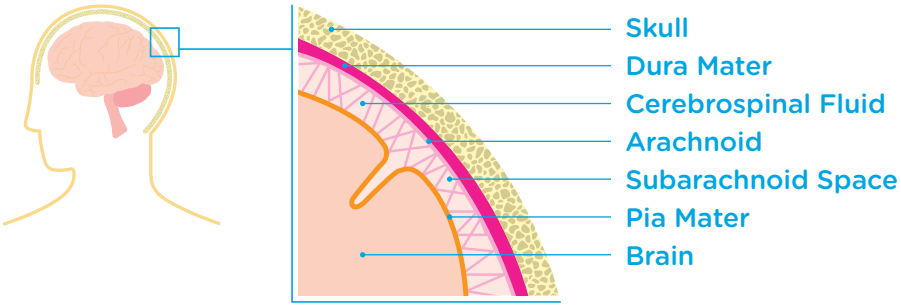
The brain is a very delicate organ. It is protected and supported by the skull and structures called the meninges and the ventricles.

The Skull

The **Skull** is a bony structure that protects the brain.

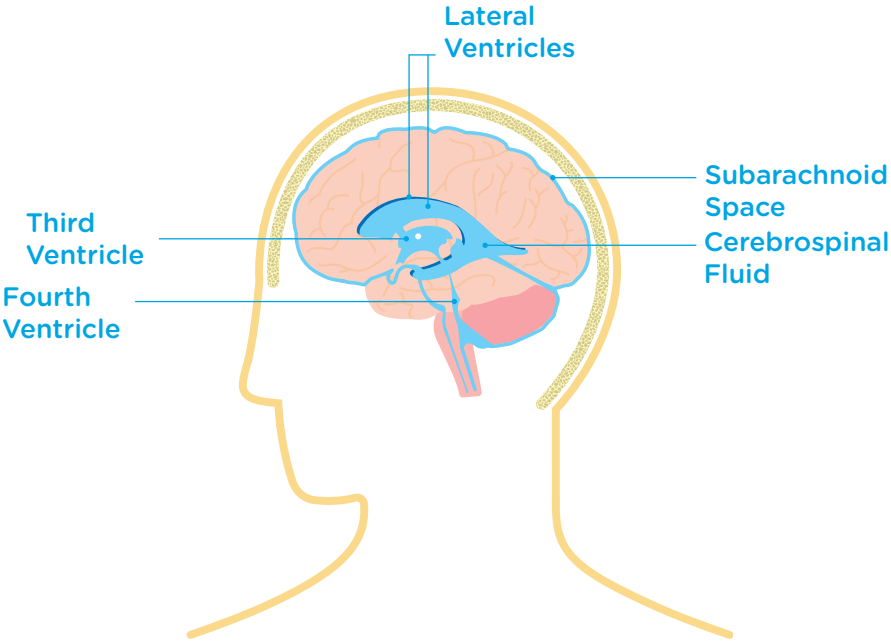
The Meninges

The **Meninges** are three protective layers that lie between the brain and the skull. They are called the **Dura Mater**, the **Arachnoid** and the **Pia Mater**. The meninges cover and protect the brain.



The Ventricles and Cerebrospinal Fluid

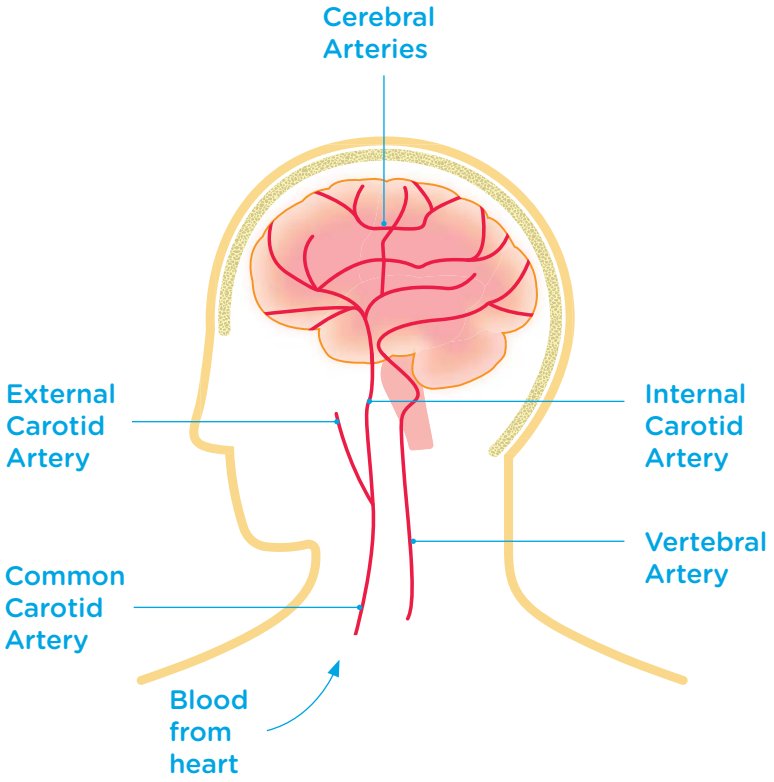
- There are four fluid-filled chambers inside the brain called **Ventricles**.
- The ventricles produce **Cerebrospinal Fluid**. This is a clear liquid that surrounds the brain and spinal cord.
- Cerebrospinal fluid protects the brain by cushioning the effect of any blows to the head.
- The cerebrospinal fluid also nourishes the brain.



The Brain's Blood Supply

A good blood supply to the brain is vital. This is because blood carries the oxygen and nutrients that brain cells need to stay alive.

There are a number of important blood vessels supplying the brain, including the **Carotid Arteries** the **Vertebral Arteries** and the **Cerebral Arteries**.



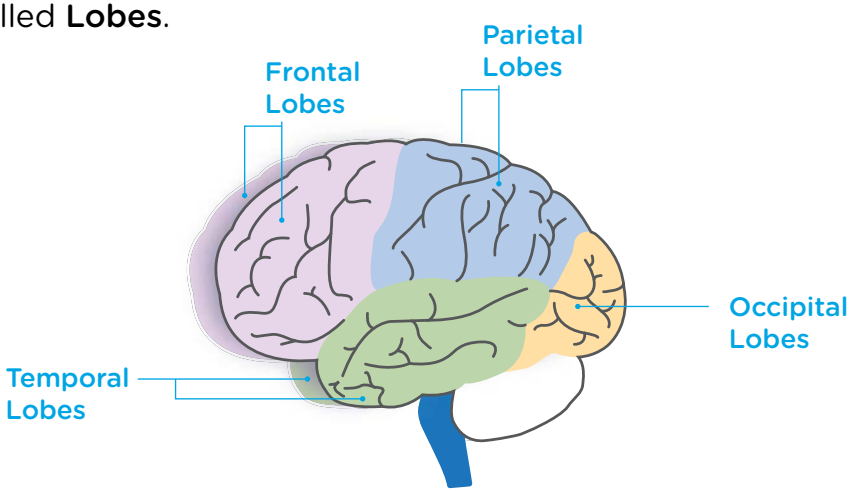
The Parts of the Brain and What They Do

The Cerebral Cortex (or Cerebrum)

The **Cerebral Cortex** is the outer layer of the brain. It is divided into two halves called hemispheres. Research shows that each half of the brain has its own distinct functions; for example: in most people the left half of the brain manages language skills, while the right half is more strongly involved in what are known as **Visuospatial Skills** (we use visuospatial skills for things like finding our way around). However, most brain functions rely on several different parts of both halves of the brain working together; the way that memory works is a good example of this.

The Lobes of the Brain

Each half of the brain is divided into four areas called **Lobes**.



The Frontal Lobes

The **Frontal Lobes** are located in the front of the brain. They are very large and have many functions. The frontal lobes are considered to be our emotional control centre. They play a central role in our personality and how we act. They are also involved in attention skills and controlling movement.

The frontal lobes manage skills known as **Executive Functions**. These are very important skills we use for things such as solving problems, planning, making decisions and controlling our behaviour. The frontal lobes work like the conductor of an orchestra who keeps all the musicians playing together harmoniously.

See page 27 for a list of some effects of an injury to the Frontal Lobes.

The Temporal Lobes

The **Temporal Lobes** are located on the side of your brain just above your ears. One of their important functions is to help us process and understand sounds such as musical notes and speech. Other functions include managing our emotions and recognising faces. A part of the temporal lobe, called the **Hippocampus**, also plays an important role in memory (diagram on page 12).

See page 28 for a list of some effects of an injury to the Temporal Lobes.

The Parietal Lobes

The **Parietal Lobes** are located behind the frontal lobes and above the temporal lobes. One of their main functions is to allow us to make sense of things we touch - for example, whether an object is smooth or sharp, firm or soft.

The parietal lobes also tell us where our body is in relation to the objects around us. This allows us to move around without bumping in to things. This function is known as **Visuospatial Processing**.

The parietal lobes are also important for skills such as maths, spelling, hand-eye coordination and fine motor movements such as tying shoe laces.

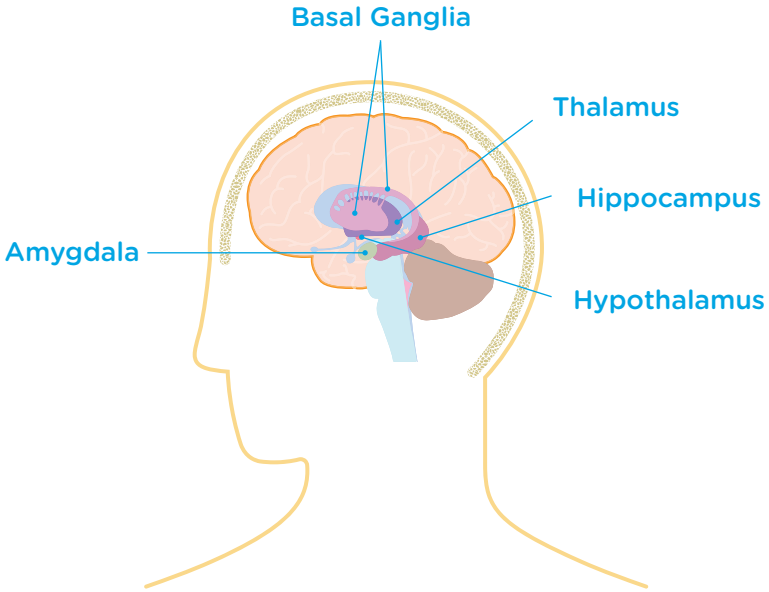
See page 28 for a list of some effects of an injury to the Parietal Lobes.

The Occipital Lobes

The **Occipital Lobes** are located at the back of the brain. They have an important role in vision because they allow us to make sense of information that comes from our eyes. This process is known as **Visual Perception**.

See page 29 for a list of some effects of an injury to the Occipital Lobes.

Deep Brain Structures



The Basal Ganglia

The **Basal Ganglia** are structures that lie deep within the brain, underneath the cerebral cortex. The main role of the basal ganglia is to coordinate movement. They are also important in processing information and in managing our moods.

The Limbic System

The **Limbic System** is the name given to a collection of structures that lie underneath the temporal lobes. Some of the key structures in the limbic system are the **Hypothalamus**, the **Thalamus**, the **Hippocampus** and the **Amygdala**. All these structures function by communicating with each other.

The limbic system plays an important role in learning, memory, emotions, instincts, motivation, mood, pleasure, pain and smell. It is also important in managing basic urges; for example, eating when we feel hungry and drinking when thirsty.

The Pituitary Gland

The **Pituitary Gland** is located in front of the amygdala (diagram on page 14). It releases hormones that are involved in sexual function and encourage bone and muscle growth. The pituitary gland also releases hormones that help us respond to stress and fight disease.

The Pineal Gland

The **Pineal Gland** is located behind the thalamus and helps control our 'internal clock' (diagram on page 14). It does this by releasing a hormone called **Melatonin** when it is dark. Melatonin makes us feel like sleeping.

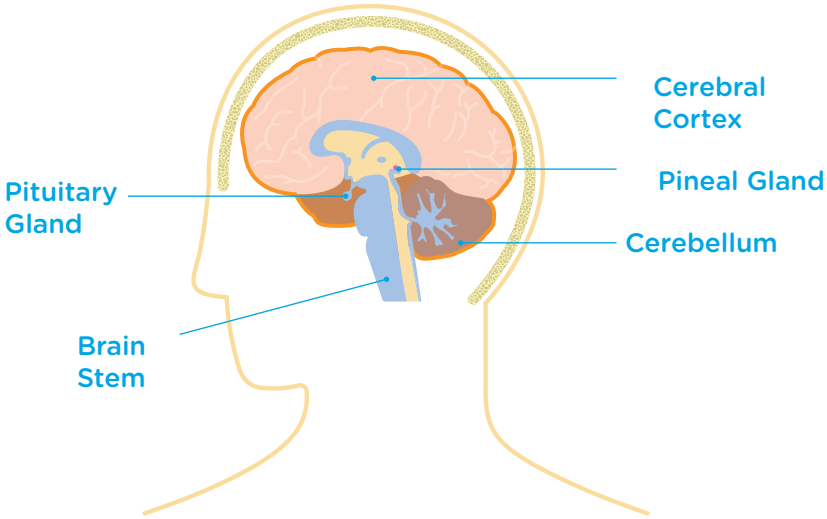
Hormones are chemical messages made in the body usually by special glands. This system of glands and hormones is called the Endocrine System. Hormones control what certain cells or organs do; for example, the pituitary gland makes human growth hormone which is needed to grow and repair cells in the body.

The Brainstem

The brainstem manages important basic body functions such as our heartbeat, breathing and blood pressure.

The Cerebellum

The cerebellum is located behind the brainstem. It controls balance and coordination.



Brain injury

What is an Acquired Brain Injury (ABI)?

An Acquired Brain Injury (ABI) is any sudden damage to the brain that occurs during a person's lifetime. Acquired brain injuries are grouped into two main types: Traumatic Brain Injury and Non-Traumatic Brain Injury. Causes of non-traumatic brain injuries include strokes, lack of oxygen, infections and tumours (see pages 19 - 25 for more information on these).

Traumatic Brain Injury (TBI)

A Traumatic Brain Injury happens when an outside force is applied to the brain, or body, that affects the brain's functioning. Common causes of a traumatic brain injury include car crashes, assaults, falls, sport accidents or an object penetrating the skull.

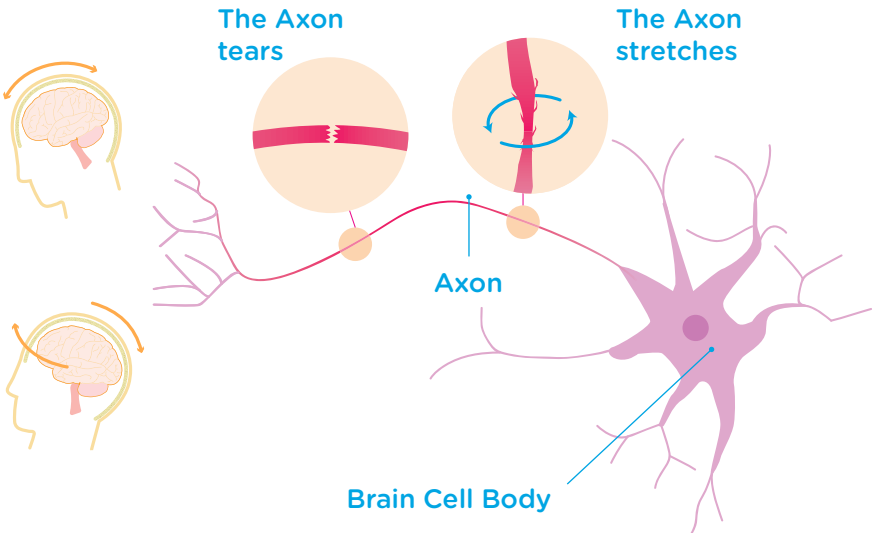
The degree of damage following a Traumatic Brain Injury can depend on several factors, including how the injury happened and how much force was involved.

What happens in a Traumatic Brain Injury (TBI)?

A TBI may include one or more of the following:

1. Burst blood vessels inside the skull. This results in bruises or bleeding - for example:
   - A **Contusion** - a bruise on the brain caused by blood leaking from tiny vessels.
   - A **Haematoma** - a pool of blood that develops when a vessel bursts in or around the brain. Sometimes surgery is performed to remove haematomas as they can cause pressure to build up inside the skull.
   - A **Brain Haemorrhage** - bleeding in, or around, the brain when a blood vessel tears or bursts (see pages 20 - 22 for more information on haemorrhages).
2. **Swelling (Oedema)** is the body's response to many injuries. Brain swelling can be serious because the skull cannot stretch as the brain gets bigger. As pressure builds up, the brain presses against the skull. This can make the person affected seriously ill or can even be fatal. Swelling of the brain can occur hours, or days, after the initial injury.
3. **A Skull Fracture** is any break or crack in the bones of the skull. A fracture can cause damage to the brain's protective layers, blood vessels or the brain itself.
4. **A Diffuse Axonal Injury** results from the brain rapidly moving back and forth, and twisting, in the skull. This causes stretching and/or tearing of the brain cell fibres (**axons**). A diffuse axonal injury can also cause brain cells to die which results in swelling.

Diffuse Axonal Injury



This type of injury is called ‘diffuse’ because it is spread over a large area of the brain.

Brain Scans

Brain scans allow doctors to ‘see’ inside our brain. A scan can locate the areas of the brain affected by an injury. CT and MRI scans are the most commonly used types. CT stands for ‘Computerised Tomography’ and MRI stands for ‘Magnetic Resonance Imaging’. However, not all brain injuries are visible on routine scans.

Severity of a Traumatic Brain Injury

The severity of a Traumatic Brain Injury is often described as 'mild', 'moderate' or 'severe'. This indicates the extent of damage to the brain. The severity of a brain injury is traditionally based on how long someone is unconscious, the length of their **Post-Traumatic Amnesia (PTA)** and brain scan results.

Post-Traumatic Amnesia (PTA)

When a person is coming out of a coma, they go through a gradual process of regaining consciousness. This stage of recovery may last for hours, days or weeks and is called Post-Traumatic Amnesia (PTA). PTA refers to a particular kind of memory loss where the person is unable to store recent memories such as what happened a few hours, or even minutes, ago. They may not know where they are and sometimes who they are. In most cases, PTA passes when the person's brain has recovered enough to make sense of what is happening.

Concussion (or Mild Traumatic Brain Injury)

A **Concussion** is a Mild Traumatic Brain Injury where the person is usually unconscious for less than 30 minutes. However, it is possible to have concussion without being unconscious. Common symptoms of concussion are headaches, confusion, nausea,

dizziness, memory problems and fatigue. Usually symptoms improve in a few days or weeks but they can last longer. After any suspected concussion, it is important to get your doctor's advice on the best treatment.

Non-Traumatic Brain Injury

There are a number of causes of Non-Traumatic Brain Injury, such as: (1) Strokes [including Brain Haemorrhages], (2) Infections, (3) Lack of Oxygen and (4) Brain Tumours. Other causes of a brain injury may result in a condition called Encephalopathy (see page 25 for more information).

1. Strokes

A stroke happens when a blood vessel in, or around, the brain bursts or is blocked. This causes damage to the brain cells. There are two main types of strokes - Ischaemic Stroke and Haemorrhagic Stroke.

A Haemorrhagic Stroke is also known as a Brain Haemorrhage (see page 20 for more information).

1.1 Ischaemic Stroke

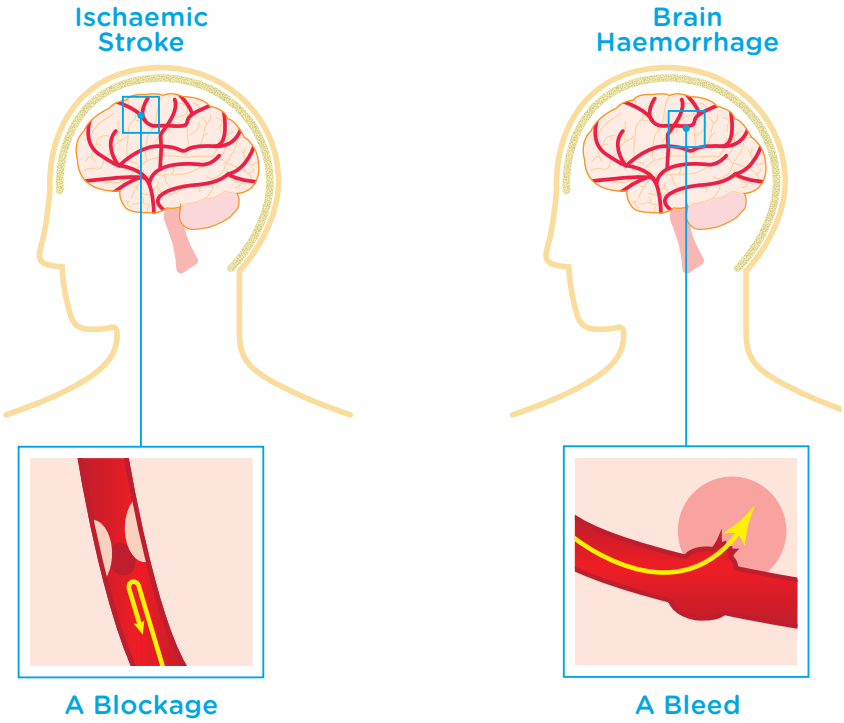
An Ischaemic Stroke is caused when a blood vessel supplying the brain becomes blocked. Brain cells become deprived of oxygen and eventually stop working. About 85% of all strokes are ischaemic.

What causes an Ischaemic Stroke?

- A common cause is hardening and narrowing of the arteries. This is known as **Atherosclerosis**.
- Another cause of an ischaemic stroke is when a blood clot forms in the heart and travels up to

the brain. This can happen due to a heart attack, problems with the heart valves or an irregular heartbeat. A condition known as **Atrial Fibrillation** can cause an irregular heartbeat.

- Other causes of an ischaemic stroke include the use of illegal drugs, a traumatic injury to the blood vessels in the neck or medical conditions that make the blood clot too easily.

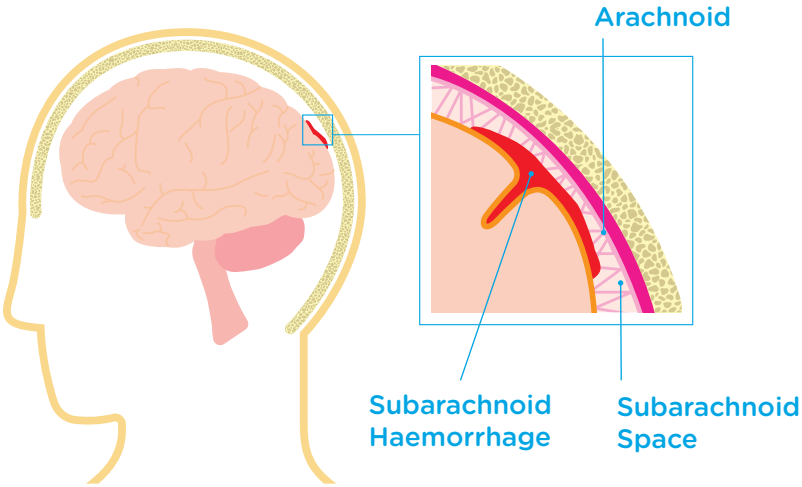


1.2 Brain Haemorrhage (Haemorrhagic Stroke)

A **Brain Haemorrhage** is sometimes called a 'brain bleed'. A haemorrhage happens when there is bleeding in, or around the brain as a result of a burst blood vessel. Brain haemorrhages make up about 15% of all strokes. There are two main types:

- A **Subarachnoid Haemorrhage** happens when a blood vessel bursts in the area between the brain and its protective layers, the meninges. This area is called the Subarachnoid Space (diagrams here and on page 6).
- An **Intracerebral Haemorrhage** happens when a blood vessel bursts inside the brain itself.

Subarachnoid Haemorrhage

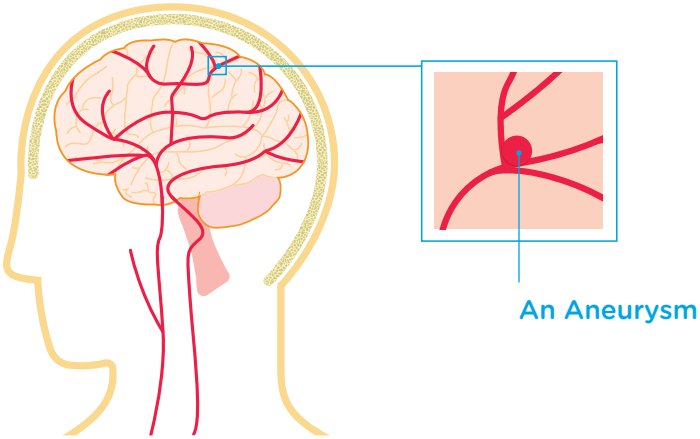


What Causes a Brain Haemorrhage?

A brain haemorrhage can be caused by many conditions that affect the blood vessels, including:

- Uncontrolled high blood pressure (known as **Hypertension**).
- An **Arteriovenous Malformation (AVM).** This is the name given to an abnormal tangle of blood vessels that some people are born with. The walls of the blood vessels are thin and this can lead to bleeding in the brain if they burst.
- An **Aneurysm**. This is a weak spot on an artery that has bulged out. The walls of an aneurysm can burst because they are thin and weak from being stretched. Some people are born with an aneurysm; others may develop one during their lifetime. Some factors that increase the risk of developing an aneurysm are smoking, high blood pressure, a family history of aneurysms and using illegal drugs.

An Aneurysm



- A brain haemorrhage can also happen if medications taken to prevent the blood from clotting are poorly controlled. These medications are known as **Anticoagulants**.
- Illegal drugs, such as cocaine, can irritate the walls of blood vessels in the brain. This makes the walls weaker and more likely to burst.
- A traumatic brain injury can also cause a brain haemorrhage (see page 16).

A 'Mini-stroke' or TIA (Transient Ischaemic Attack)

A TIA happens when blood flow to part of the brain stops for a short while. A TIA can have similar symptoms to a stroke but the symptoms may disappear after a few minutes. A TIA is a serious warning sign that the person affected may have a stroke in the future.

Symptoms of a TIA can include: weakness on one side of the body or face, slurred speech, blurred vision, severe headache or confusion. If you experience any of these symptoms you should go to your GP, or Accident and Emergency Department, without delay.

2. Infections

- Infections of the brain, or spinal cord, can result in dangerous inflammation. In some cases, the cause of the inflammation is unknown.
- **Meningitis** is inflammation of the meninges, the protective layers around the brain.
- **Encephalitis** is inflammation of the brain itself. Inflammation can damage brain cells and their ability to function. This can lead to a wide range of symptoms including a fever, headaches, seizures, changes in behaviour or confusion. In some cases, inflammation causes injuries to the brain which can be fatal.

3. Lack of Oxygen (Anoxia and Hypoxia)

It is vital that the brain gets enough oxygen. Brain cells start to die if their oxygen supply is significantly reduced for four minutes or longer. After five minutes, this can cause a permanent brain injury. The greater the loss of oxygen, the more widespread and serious the injury is likely to be.

- Factors that may cause a lack of oxygen include: severe irregular heartbeat, a heart attack, poisoning, suffocation, choking, carbon monoxide poisoning, electrocution, a drug overdose and near-drowning.
- **Anoxia** means a total lack of oxygen to the brain.
- **Hypoxia** means a partial lack of oxygen to the brain.

4. Brain Tumours

- A tumour is an abnormal growth of cells. The exact cause of brain tumours is not clear.
- Brain tumours come in many forms. Their effects depend on factors such as their location, how quickly they grow and the amount of pressure on the brain they cause.
- As a tumour grows, it takes up more space in the skull and pushes on the brain. This results in swelling which can affect the supply of blood and oxygen to healthy brain cells.
- Common symptoms of a brain tumour include headaches, numbness or tingling in the arms or legs, seizures, memory problems, mood and personality changes, balance problems and changes in speech, sight or hearing.
- A brain injury can result, not just from the effects of the tumour, but also from the chemotherapy, radiation or surgery used to treat it.

Encephalopathy

Encephalopathy is a general term used for a condition that affects the function or structure of the brain. There are many types of encephalopathy - some are permanent and cause a brain injury, while others are temporary.

Encephalopathy can often be a complication of another medical condition - liver failure or kidney failure, for example. Changes in the body due to a poison, illegal drugs or alcohol (known as **Alcohol-Related Brain Injury**) can also cause encephalopathy.

Effects of a Brain Injury

Please note:

- In this section, we give details of many possible effects of a brain injury.
- Some people may have other less-common effects that are not covered in this booklet.
- To see some effects of a brain injury on the following:
  - The lobes of the brain, go to page 27.
  - The body and senses, go to page 30.
  - Communicating and thinking skills, go to page 32.
  - Emotions and behaviour, go to page 34.
  - Sexual difficulties, go to page 35.
- We have put the technical word for some of the effects into brackets for your information.
- Page 37 has contact details for Headway and other organisations that offer help and information to anyone affected by a brain injury.

It is important to note that every brain injury is different and the range of difficulties experienced varies from person to person.

Some Effects of an Injury to the Frontal Lobes

The frontal lobes are particularly vulnerable to injury because they are large and are at the front of the brain. An injury to the frontal lobes can lead to a number of changes including:

- Changes in personality.
- Difficulties with attention and taking in information.
- Emotional responses may be reduced.
- Difficulties with motivation (Apathy) or getting things started (Initiation).
- Changes in the ability to control behaviour (Disinhibition). This means that the person may be more impulsive. They may say or do things without considering the consequences.
- Reduced self-awareness (Anosagnosia).
- Poor judgment and decision-making.
- Difficulty planning things and meeting goals.
- 'Black and white' thinking (Concrete Thinking).
- Irritability and less tolerance of frustration.
- Getting 'stuck' repeating certain ideas or actions (perseveration).

See page 10 for more on the Frontal Lobes.

Some Effects of an Injury to the Temporal Lobes

- Difficulty in recognising faces, things or places.
- Difficulty understanding or remembering what people say.
- Difficulty reading.
- Difficulty recognising objects.
- Short-term memory difficulties.
- Changes in sexual behaviour.
- Increased aggression.

See page 10 for more on the Temporal Lobes.

Some Effects of an Injury to the Parietal Lobes

- Difficulty naming objects (Anomia).
- Difficulty in distinguishing left from right.
- Difficulties with hand-eye coordination.
- Difficulty making sense of what we see even if we do not have a visual impairment (Visual Perceptual difficulty).
- Difficulty knowing the function of an object.
- Problems with reading (Alexia), writing
- (Agraphia) or maths (Dyscalculia).

- Difficulty knowing where things are in relation to our own bodies; for example, how close an object is to us (Spatial Awareness Difficulties).
- Reduced self-awareness (Anosognosia).
- **Visual Neglect** (see the box below).

Visual neglect is an attention disorder which may be caused by a brain injury.

It prevents the person affected from noticing things, or people, that are to one side of them. This is most often on their left-hand side - for example, during a meal the person may eat all the food on the right half of their plate but leave the left half untouched.

See page 11 for more on the Parietal Lobes.

Some Effects of an Injury to the Occipital Lobes

- Sight defects (known as Visual Field Cuts).
- Blurred vision or sight loss.
- Visual hallucinations and distortions.
- Difficulty with identifying colours (Colour agnosia).
- Difficulty recognising words.
- Difficulty recognising when people, or things, are moving (Motion blindness or Akinetopsia).

See page 11 for more on the Occipital Lobes.

Effects of a Brain Injury on the Body and Senses

Fatigue

Many people experience extreme tiredness (fatigue) following a brain injury.

Disturbed Sleep

A large proportion of people with a brain injury experience sleep difficulties. Disturbed sleep at night can also lead to drowsiness during the day.

Headaches and/or Pain

Headaches and pain are quite common after a brain injury. They can vary in severity and frequency.

Right or Left-sided Weakness

The right side of the brain controls the left side of the body, while the left side of the brain controls the right side of the body. Depending on which part of the brain is injured, the person may have a physical weakness mainly on one side of the body. This is a common problem for people after a stroke.

Balance and Coordination

Difficulties with balance can make it more difficult to walk unaided. The person affected may also have difficulties with co-ordinating their movements - particularly fine motor movements, such as tying shoe-laces or buttoning a jacket.

Sight, Visual Perception and Sensory Difficulties

Difficulties with sight and/or visual perception can include problems with seeing things far away, judging distances, reading maps, doing puzzles and recognising things. **Visual Perception** is the mental process of recognising and interpreting things we see.

The senses of smell, taste or touch can also be affected. Some people may have difficulties with hearing; for example, experiencing ringing or buzzing noises (Tinnitus) or become very sensitive to noise.

Seizures

Seizures are common after a traumatic brain injury but they can also occur following other types of brain injury.

Seizures and Epilepsy

Cells in the brain communicate using electrical messages. When these electrical messages are suddenly disrupted, the person can have a seizure.

A seizure may cause a loss of consciousness, involuntary movements, a change in behaviour or a combination of all these. If someone has more than one seizure, they may be diagnosed as having Epilepsy.

Incontinence

A brain injury can affect a person's ability to control their bowel or bladder.

Swallowing Difficulties

A difficulty with swallowing is called **Dysphagia**. Dysphagia is common after a stroke. It is caused by damage to the nerve cells that control the muscles used for chewing and swallowing

Effects of a Brain Injury on Communication and Thinking Skills

Communication is the sending and receiving of information between two or more people. After a brain injury, some people have trouble communicating. Common communication difficulties are:

Dysarthria is a condition where the person affected may speak quickly, slowly, quietly or with a slur. After a brain injury, this can happen due to weakness in the muscles of the face, tongue, voice box and/or the muscles used for breathing.

Aphasia is any impairment of language.

- **Receptive Aphasia** is when someone has difficulty understanding written language and what people are saying.
- **Expressive Aphasia** is when someone has difficulty talking and expressing ideas. They may also find writing difficult.

Apraxia of Speech is when someone has difficulty coordinating the muscles they use to speak. The messages from the brain to the mouth are disrupted. The muscles are not weak but the person cannot move them in the way needed to make the correct sounds.

Memory

It is very common to have difficulties with memory after a brain injury. These can include problems with remembering skills we had mastered, conversations, appointments or even important events in our lives.

Attention and Concentration

It is also common to have difficulties with concentration after a brain injury (the words 'concentration' and 'attention' are interchangeable). The person affected may become easily distracted, have trouble keeping track of what is being said or done, experience information 'overload' or have difficulty doing more than one task at a time.

Information 'Overload'

Many people have difficulty taking in, or processing, larger amounts of information following a brain injury. They may also be slower at processing the information. These difficulties can result in the person feeling overwhelmed, frustrated or excluded. They may find it helpful to have information broken down into smaller points and to have extra time to respond.

Planning, Reasoning and Making Decisions

Executive Functions are a group of very important skills. We use these skills for things such as solving problems, planning, making decisions and controlling our behaviour. If the frontal lobes of the brain are injured, these skills can be affected.

Effects of a Brain Injury on Emotions and Behaviour

Irritability and Anger

Some people may experience increased irritability and anger following their brain injury. There are a number of reasons for this: for example, damage to the frontal lobes or a reduced ability to cope with frustration.

Some people find they become more easily overwhelmed in crowded or busy situations. Other causes of anger include the person misinterpreting why someone did or said something. Irritability and anger may result in the person affected doing things such as swearing, breaking things or acting inappropriately.

Reduced Awareness (Reduced Insight and Lack of Insight)

Sometimes after a brain injury a person may not be aware of their difficulties. This is often referred to as having '**Reduced Insight**' or '**Lack of Insight**'. Changes in insight are often as a direct result of the brain injury.

Depression, Anxiety or Loss of confidence

Some people experience difficulties with their mood after a brain injury. There are a number of reasons for this, including chemical and physical changes in the brain as a result of their injury. Changes in someone's mood can also emerge as they begin to come to terms with the impact of their brain injury. This can lead to a loss of confidence, lowered self-esteem and sometimes depression.

Low Motivation (Apathy)

Difficulties with motivation are commonly seen after damage to the frontal lobes of the brain. The person

affected may have a lack of motivation to do activities, to set goals or to work towards achieving goals.

Inability to Control Emotions (Lability)

Sometimes after a brain injury a person can no longer control how they express their emotions. This is known as **Emotional Lability**. They may move quickly from one strong emotion to another, often in ways that may seem inappropriate; for example, they may laugh in a situation that is actually sad.

Impulsivity and Inappropriate Behaviour

Some people may become disinhibited after their brain injury. This means they may have less control over their behaviour, they may be more impulsive or say and do things without considering the consequences; for example, they may blurt out a hurtful remark that they did not intend.

Inflexibility

After a brain injury, some people may lose their ability to be flexible in different situations. This problem may make them seem difficult or unreasonable.

Difficulties with Empathy

Some people, due to their brain injury, find it more difficult to identify with other people's feelings. This lack of empathy may make them seem self-centred. This can be difficult for family members and friends.

Sexual Difficulties

Sexual difficulties are common after a brain injury. This can be due to many reasons including pain or changes in movement, touch or communication. The person affected may experience difficulty enjoying, or having,

sexual activity. Some medications can also lower sex-drive. In addition, many people experience depression, anxiety or changes in how they feel about themselves and/or their body after their brain injury.

How exactly each person is affected, will depend on factors such as which parts of their brain were injured and how severely. Naturally, the person's intimate relationship with their partner will also be influenced by what it was like before the injury.

The Brain's Ability to Adapt (Neuroplasticity)

Neuroplasticity is the brain's unique ability to reorganise, change and adapt. One way that neuroplasticity works is by forming new pathways and connections between brain cells. This happens when, for example, we learn new skills or experience different situations. So, while neuroplasticity is a normal part of our everyday lives, the processes involved are complex and not yet fully understood.

However, it is known that neuroplasticity is significant in recovering from a brain injury because it allows our brains to reorganise and re-learn. Therefore, it is the basis of many rehabilitation programmes. Part of the goal of these programmes is to try to build new connections between brain cells.

There are limits to how much our brains can recover, however. Neuroplasticity enables the brain to adapt to an injury but sometimes an area is so extensively damaged that its ability to reorganise is not sufficient to regain the lost function.

Help and information

Information

Visit www.headway.ie:

- For further information and where to get support, including the leaflet 'Getting What You Need After a Brain Injury'.
- For free community-based brain injury rehabilitation and counselling in Cork, Dublin, Kerry and Limerick.
- For ways to connect with other people affected by a brain injury.
  t: Lo-call 1890 200 278 or 01 6040 800
  w: www.headway.ie

Acquired Brain Injury Ireland

Acquired Brain Injury Ireland offer assisted-living, case-management and community rehabilitation services.
t: 01 280 4164 **w:** www.abiireland.ie

Irish Heart Foundation

The Irish Heart Foundation run a Heart and Stroke Helpline. They also provide information and contacts for stroke support groups and clubs.
Helpline t: 1800 25 25 50 **w:** www.irishheart.ie

HSE Information Line

t: 1850 24 1850 **w:** www.hse.ie

List of Headway Booklets

HEADWAY
Brain Injury Services & Support

These booklets are available to order from Headway. You can also read them online or download them from: www.headway.ie/information

Headway t: Lo-call 1890 200 278 or 01 6040 800

- The Family Guide to Brain Injury

The **Brain Injury Series** of booklets was written for, and with, people with a brain injury and includes:

- Returning Home
- Fatigue and Sleep
- The Brain and Brain Injury
- Memory
- Attention and Concentration
- Planning and Organising
- Communicating
- Mood swings, Irritability and Anger
- Feeling Low or Anxious
- Relationships and Intimacy
- Driving
- Alcohol after Brain Injury
- Returning to Work or Other Activities

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HEADWAY

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