



Understanding death and donation



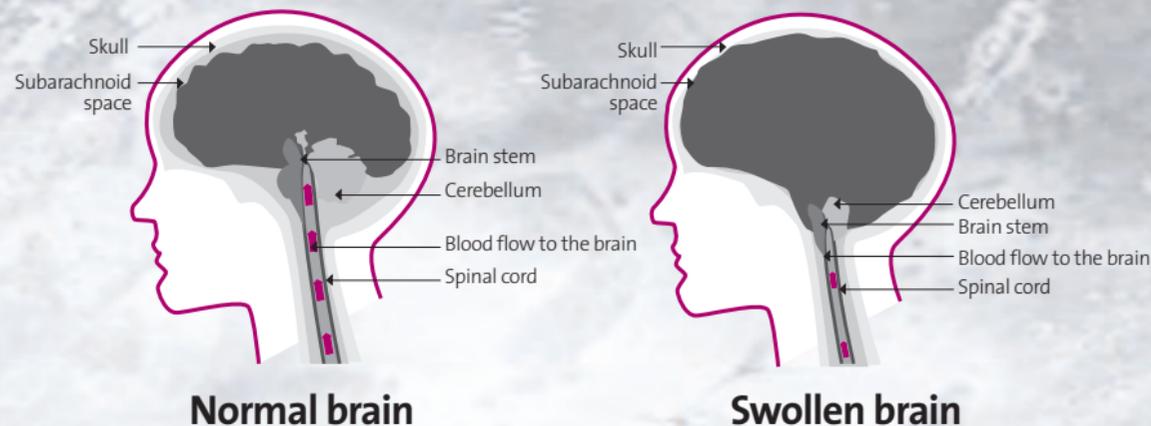
Brain death

Brain death occurs when the brain has been so badly damaged that it completely and permanently stops functioning. This can occur as the result of severe head injury, bleeding in the brain such as a stroke or haemorrhage, brain infection or tumour, or lack of oxygen to the brain.

Just like any other part of the body, when the brain is injured, it swells. The brain is contained within a rigid box, the skull, which normally protects it from harm but also limits how much the brain can expand when it starts to swell. This is different to other parts of the body, such as an injured ankle, that can continue to swell without restriction. If the brain continues to swell, pressure builds up within the skull causing permanently damaging effects.

The swelling places pressure on the brainstem where the brain joins with the spinal cord at the back of the neck. The brainstem controls many functions that are necessary for life including breathing, heart rate, blood pressure and body temperature.

As the brain swelling increases, the pressure inside the skull increases to the point that the blood vessels going to the brain tissue are squashed. Eventually the blood, which contains the oxygen, stops going to the brain (see Diagram 1). Without blood and oxygen, brain cells die. Unlike many other cells in the body, brain cells cannot re-grow or recover. If the brain cells die, that person's brain will never ever function again, and the person has died, which is called "brain death".



The brain and brainstem control many of the body's vital functions, including breathing. When a person has suffered a brain injury, they are connected to a machine called a ventilator, which artificially circulates oxygen into the lungs. The oxygen is then pumped around the rest of the body by the heart. The heartbeat does not rely on the brain, but is controlled by a natural pacemaker in the heart that functions when it is receiving oxygen.

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While a ventilator is providing oxygen to the body, the person's chest will continue to rise and fall giving them the appearance of breathing, their heart will continue to beat and they will feel warm to touch. These signs can make brain death difficult to understand. However, even with continued ventilation, the heart cannot continue to beat forever and will eventually stop functioning.

How do doctors know that a person's brain has died?

People who are critically ill in the hospital are under constant observation by the specialist medical and nursing teams caring for them and are closely monitored for changes in their condition. There are a number of physical changes that take place when the brain dies. These include loss of pupillary reaction to light, inability to breathe without the ventilator, and reduced heart rate, blood pressure and body temperature.

When the medical team observes these changes they will perform clinical brain death testing to confirm whether the brain has stopped functioning or not.

Two senior doctors will independently conduct the same set of clinical tests at the bedside. The doctors performing the brain death testing will be looking to see if the person has any:

- ▶ response to a painful stimulus
- ▶ response to light by the pupil of the eye
- ▶ blinking response when the eye is touched
- ▶ eye movement response when ice cold water is put into the ear canal
- ▶ cough or gag reaction when the back of the throat is touched
- ▶ ability to breathe when the person is disconnected from the ventilator.

If a person shows no response to **all** of these tests, it means that their brain has stopped functioning and the person has died. Although they have died the heart will still be beating because oxygen is still getting to the heart with the help of the ventilator.

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There are times when the patient's injuries mean that they are not able to have all of these clinical brain death tests done. For example, severe facial injuries may restrict access to the eyes or ears. In these circumstances, medical imaging tests are done to check if there is any blood flow to the brain. These may include tests like a dye test of the blood vessels in the brain (a cerebral angiogram or cerebral perfusion scan). The hospital staff will provide further information if these tests are necessary.

What happens after brain death has been confirmed?

Once brain death has been confirmed, the patient will remain connected to the ventilator while members of the medical team speak with the person's family about the next steps. These will include the person's end-of-life wishes, the opportunity for organ and tissue donation and timing of removing the ventilator.

If the family supports donation, everything possible will be done to make sure those wishes are fulfilled. Timeframes can vary as every circumstance is different. It can take up to 24 hours for the necessary arrangements for donation to be made. The person will remain connected to the ventilator during this time to keep blood and oxygen circulating to the organs. In some cases medications are necessary to ensure organs remain suitable for donation. If it becomes clear that organs are no longer suitable for donation, it may still be possible for donation of eye, heart, bone and skin tissues.

When the arrangements for donation have been made, the person will be moved to the operating theatre for the organ and tissue retrieval surgery. The ventilator will be removed during the operation.

If donation is not supported, the doctor will speak with the family about removing the ventilator. When the ventilator is removed, the person's heart will stop beating due to a lack of oxygen and their skin will become cold and pale because blood is no longer being circulated around the body.

Care and respect are always maintained during the end of life process, irrespective of whether or not donation proceeds.