

Brain Injury

What Is a Brain Injury?

An acquired brain injury occurs after birth—meaning it's not hereditary, congenital or related to birth trauma. There are several types of acquired brain injuries, including:



Traumatic brain injury (TBI)

TBIs include concussions and their related nerve damage (neurotrauma). TBIs occur when the head is hit hard or gets whipped violently back and forth.

Nontraumatic brain injury

Nontraumatic brain injuries happen when something inside the brain alters the health or normal functioning of the brain. Nontraumatic brain injuries can be caused by illnesses such as encephalitis and meningitis, or can be related to a stroke or tumor.

Anoxic brain injury

Moderate to severe brain injuries can occur when there is an extended lack of oxygen to the brain due to a near drowning or asphyxiation.

Hypoxic brain injury

This type of injury occurs when there is a decreased flow of oxygen to the brain as a result of a TBI or illness.

What Causes Brain Injury?

Factors that can cause acquired brain injuries include:

- Strokes.
- Lack of oxygen for long periods of time (anoxic brain injury).
- Infections, such as encephalitis or meningitis.
- Encephalopathy, including: severe dehydration, overhydration, illness of the liver or pancreas, disruption of the heart or exposure to toxic chemicals or drugs.
- Decreased flow of oxygen (hypoxic brain injury).
- Trauma that happens when the head is hit hard or gets whipped violently back and forth, including nonaccidental trauma such as shaking a small child.

Traumatic Brain Injuries

For children and teens, the most common causes of TBI are:

- Contact sports, such as football, hockey and soccer.
- High-risk behaviors and stunts, such as riding or jumping on top of a moving vehicle (“car surfing”) or riding on a skateboard while being pulled behind a motor vehicle (“skitching”).
- Motor vehicle accidents.
- Physical violence and abuse.
- Biking.
- In-line skating.
- Skiing.
- Skateboarding.
- Serious falls.
- Sports with high-speed elements, such as golf or baseball.

Mild to moderate TBIs are often called **concussions**. They usually require outpatient follow-up care and a gradual return to activities, when appropriate. Moderate to severe TBIs cause serious structural injuries to the brain. They usually require hospitalization and full rehabilitation services to help kids or teens relearn skills.

Nontraumatic Brain Injuries

Many factors can lead to nontraumatic brain injuries, including:

Arteriovenous Malformations (AVMs)

Already present at birth, **AVMs** are abnormal connections between arteries and veins. In some cases, AVMs bleed. Bleeding injures the brain and is considered a form of stroke. Depending on where the bleeding occurs, children can experience problems with speech, arm and leg control, understanding and learning.

Brain Tumors

Removing a tumor in the part of the brain that includes the cerebellum and brain stem (known as the posterior fossa) causes an acquired brain injury and a condition called posterior fossa syndrome.

Symptoms of posterior fossa syndrome include:

- Inability to speak.
- Speech that is difficult to understand.
- Difficulty chewing and swallowing.
- Trouble moving arms and legs.

If the nerves of the face and neck are involved, children can have trouble making facial expressions or opening and closing their eyes. They might also struggle to control their emotions.

Encephalopathy

Encephalopathy is a brain injury that happens when other functions of the body get disrupted by factors such as:

- Illnesses involving the liver or pancreas, such as diabetes.
- Disruptions to the heart that affect how well oxygen travels to the brain (anoxia).
- Severe dehydration.
- Water accumulating too quickly in the body.
- Environmental toxins, such as lead paint.
- Consuming substances such as prescription medicines, alcohol and other drugs.

Epilepsy and Seizures

Children who have **epilepsy** and a history of seizures are at risk for:

- Traumatic brain injury from a blow to the head.
- Brain injury from loss or lack of oxygen due to drowning or choking.
- Nontraumatic brain injuries from long-lasting seizures.

Infections

Infections can cause swelling that damages brain cells. Two common types of infections are encephalitis (inflammation of the brain) and meningitis (inflammation of the membranes covering the brain and spinal cord).

Both types of encephalitis are usually caused by a virus or bacteria. Depending on the location of the injury, encephalitis can cause a variety of problems, including:

- Learning difficulties.
- Speech and language challenges.
- Memory loss.
- Reduced muscle control.
- Problems with balance and coordination.

Strokes

Childhood strokes might result from:

- Brain malformations.
- Infections (such as encephalitis or meningitis).
- Trauma.
- Blood disorders.

Depending on the cause and location of the stroke, children might have trouble with speech and movement on one half of the body. Communication can be severely affected if the stroke occurs in the left side of the brain. If bleeding is severe, children might experience epilepsy and significant cognitive challenges.

Anoxic Brain Injury

When children can't breathe, nerve cells in the brain die due to lack of oxygen. The result is brain damage to part or all of the brain. Children who go without oxygen for longer periods of time usually experience more disabilities.

Children might experience lack of oxygen due to:

- Staying under water too long.
- Cardiac arrest.
- Near-suffocation.
- Blocked airway.

Hypoxic Brain Injury

Hypoxic brain injuries happen when only a decreased amount of oxygen (as opposed to no oxygen at all) can reach the brain. Hypoxic brain injuries can be just as severe as anoxic brain injuries.

Hypoxic injuries affect all children differently, depending on how long a child's brain goes without enough oxygen.

Typical causes of hypoxic brain injury include:

- Carbon monoxide poisoning.
- Near-drowning.
- Strangling.
- Choking on food.
- Near-suffocation.
- Cardiac arrest.
- Head trauma.

Brain Injury Symptoms and Effects

TBIs are the most common type of acquired brain injury. They cause a wide variety of symptoms, including damage to cells, blood vessels and nerves in the brain. TBI symptoms range in severity based on which part of the brain is affected and the extent of the damage.

Physical Symptoms

- Dizziness and/or trouble with balance.
- Headaches.
- Nausea and vomiting.
- Numbness and/or tingling.
- Sensitivity to noise.
- Visual problems and/or sensitivity to light.

Cognitive Symptoms

- Changes in school performance.

- Difficulty concentrating.
- Difficulty remembering.
- Feeling foggy, slowed down, dazed or stunned.
- Forgetting or feeling confused about recent events.
- Repeating questions and/or answering them more slowly than usual.

Emotional Symptoms

- Feeling more emotional than usual.
- Irritability.
- Nervousness.
- Sadness.
- Showing less interest in favorite activities.

Sleep and Energy Symptoms

- Drowsiness.
- Fatigue.
- Having trouble falling asleep or staying asleep.
- Sleeping more or less than usual.

Symptoms in Infants and Young Children

Because young children can't tell you how they feel, it can be difficult to recognize symptoms in infants and toddlers. In addition to the symptoms listed so far, look for the following to help you tell if a child has experienced a brain injury:

- A soft spot on the scalp, or swelling of the scalp.
- Changes in normal play or less interest in favorite activities.
- Excessive crying.
- Listlessness (child feels "floppy" in your arms and doesn't play or grab objects).

- Loss of new skills, such as walking or toilet training.
- Refusal to eat or nurse.

Brain Injury Diagnosis and Treatment

A medical professional should evaluate children immediately after any type of brain injury. Depending on the severity of the injury, initial evaluations often take place in urgent care settings, emergency rooms or trauma centers.

Mild to Moderate Injuries (Concussions)

For mild to moderate injuries (**concussions**), outpatient follow-up evaluations and care are usually recommended. At Gillette Children's Specialty Healthcare we offer expert consultations and a full range of **radiology and imaging** services, including:

- **CT scans.**
- ImPACT (Immediate Postconcussion Assessment and Testing).
- **MRI** tests.
- **Neurological evaluations.**
- **Neuropsychological evaluations.**
- Rehabilitation therapies assessment

Moderate to Severe Injuries

If your child has a moderate to severe injury, Gillette provides expert evaluations, **full inpatient rehabilitation services**, and skilled outpatient follow-up care. We partner with Regions Hospital to provide Minnesota's first **Level I Pediatric Trauma Center.**

Children who have moderate to severe brain injuries might receive the following tests:

- **CT scans.**
- **MRI** tests.
- **Neurological evaluations.**
- **Neuropsychological evaluations.**
- **Rehabilitation therapies assessment**
- Neurosurgical evaluations.

Integrated Care

If your child has a brain injury, you might notice a wide range of effects. Gillette's full-service, family-centered approach to care gives your child a chance to return as fully as possible to life and normal activities. You can count

on our exceptional team of specialists to help your child feel their best.

Your child might receive TBI treatment from experts in the following areas:

- **Chaplaincy.**
- **Child life.**
- **Rehabilitation medicine.**
- Rehabilitation nursing.
- **Rehabilitation therapies.**
- **Psychology.**
- **Social work.**
- **Therapeutic recreation.**

Whether your child needs outpatient follow-up care or full inpatient rehabilitation services, we offer the latest treatments and technologies to help them return to normal life. Gillette has the nation's largest group of pediatric rehabilitation medicine specialists. You'll work closely with these experts to create a custom treatment plan for your child.

Make An Appointment **651-290-8707** Refer a Patient **651-325-2200**

This information is for educational purposes only. It is not intended to replace the advice of your health care providers. If you have any questions, talk with your doctor or others on your health care team.

If you are a Gillette patient with urgent questions or concerns, please contact Telehealth Nursing at **651-229-3890**.