



Pediatric Epilepsy

What is Epilepsy?

Epilepsy is a neurological condition that affects the nervous system. While the underlying etiology of epilepsy is idiopathic up to 70 percent of the time, it's actually quite common, affecting one in 100 children or 1 percent of the population.

Seizures are a symptom of brain dysfunction. Seizures are sudden, abnormal changes in behavior that cause involuntary actions due to a brain malfunction. These actions can be rhythmic movements of extremities, muscle contractions, staring and/or loss of consciousness, just to name a few. Seizures can present in many different ways, and they can last from a few seconds to minutes, on average.

Having two or more unprovoked seizures results in the diagnosis of epilepsy. Provoked seizures are triggered by known causes such as fever, head trauma, lack of oxygen, metabolic or electrolyte abnormalities, ingestions or overdose of drugs. Where the causes are known, they are treated to eliminate subsequent seizures. However, two-thirds of epilepsy cases are caused by an unclear reason and the seizures are treated by antiepileptic medications.

This is where the expertise of our Level IV comprehensive pediatric epilepsy center, recognized by the National Association of Epilepsy Centers, is applied to treat epilepsy in its multitude of presentations. In collaboration with UTHealth Medical School, the pediatric epileptologists affiliated with Children's Memorial Hermann Hospital specialize in comprehensive epilepsy care at the Epilepsy Monitoring Unit (EMU). Before creating an individualized treatment plan, it's necessary to determine the type or types of seizures the patient is experiencing.

The EMU is a large, family-friendly unit with specialized equipment to help identify the type of seizures and the brain location from which they originate, and to aid in the delivery of an individualized epilepsy treatment plan.

Types of Seizures

Primary generalized seizures involve concurrent onsets of abnormal electrical activity occurring in a generalized fashion all over the brain. There are several subgroups of generalized epilepsy seizures under this category, including absence or petit mal seizures, which present without (over)

The ABCs of Epilepsy

- Antiepileptic drugs (AEDS)
- Electroencephalography (EEG)
- Epilepsy Monitoring Unit (EMU)
- Magnetoencephalography (MEG)
- Magnetic resonance imaging (MRI)
- Positron emission tomography (PET)
- Pediatric Intensive Care Unit (PICU)
- Single-photon emission computed tomography (SPECT)
- Vagus nerve stimulation (VNS)
- Video electroencephalography (VEEG)

What Does the Future Hold for Those with Epilepsy?

Even when a diagnosis of epilepsy is confirmed, most children go on to live normal lives.

Some common activities –climbing higher than their height, participating in contact sports, operating vehicles or heavy machinery–are restricted until seizures are under control.

Under the care of specialists in the Pediatric Epilepsy Program at Children's Memorial Hermann Hospital, patients, families and referring physicians are reassured that although epilepsy is lifelong, it need not be a life changer.

warning as brief episodes of staring, usually lasting approximately 10 seconds. Myoclonic seizures cause bilateral aberrant movements such as jerking or twitching. A tonic-clonic seizure is the type most people envision when they hear the word “seizure.” Sometimes known as grand mal seizures, the tonic phase of muscle stiffness presents first, followed by the clonic phase of rapid, rhythmic and sometimes quite dramatic jerking and twitching. Generalized tonic-clonic seizures can last several minutes, and the patient is often confused upon regaining consciousness. Tongue biting and urinary incontinence can also occur during generalized seizures.

Focal seizures are also known as partial seizures because they arise from one region of the brain. During focal seizures, the patient is alert and often retains full memory of the episode.

In-depth Diagnostics

By using various clinical diagnostic modalities and advanced technologies, the Pediatric Epilepsy Program can further evaluate epilepsy. Here are the types of epilepsy diagnostics a patient might experience:

- Electroencephalography (EEG) records electrical activity in the brain similar to how EKGs record the electrical activity of the heart.
- Magnetic resonance imaging (MRI) identifies structural abnormalities or malformations in the brain.
- Magnetoencephalography (MEG) measures magnetic fields generated by neuronal brain activity.
- Positron emission tomography (PET) is a molecular imaging procedure that provides detailed pictures of what’s going on at the molecular and cellular level.
- Single-photon emission computed tomography (SPECT) is a low-level radioactive test that measures blood flow to specific portions of the brain.

Next Steps and Treatments

Epilepsy patients can lead a seizure-free life with antiepileptic/anticonvulsant medications, specialized diets and/or surgical resection of the seizure focus. If the patient is refractory to antiepileptic medications, a vagal nerve stimulator (VNS) and/or the ketogenic diet may be considered.

A VNS is a computerized battery-powered electrical stimulation device similar in size and shape to a heart pacemaker. It is connected to the vagus nerve and emits a signal to interrupt atypical electrical activity to the brain. Approximately 50 percent of patients experience reduced seizure activity with the VNS placement.

When a seizure focus resective surgery is needed, routine preoperative testing is required. This includes laboratory testing and an appointment with anesthesia. The final stage of the epilepsy surgery work-up could include a two-stage procedure in which electrodes are placed directly on the brain in the operating room to record seizures. This procedure couples intracranial electrode placement with video EEG monitoring. After surgery, the patient is monitored for seizure activity in the EMU by electrodes that continuously record brainwave activity to pair the electrical activity with the clinical manifestations of the seizure. The purpose of this final stage is to localize the seizure focus for resection. Seizure-free efficacy rates of resective surgeries range from 50 to 80 percent.



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