A REVIEW ON MANAGEMENT OF EPILEPSY COMPLICATIONS IN HEALTH CARE PRACTICE

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ABSTRACT
Epilepsy is one of the chronic disorder of brain affecting world wide. It describes continuous seizures with brief episodes and spreads entire body, causes loss of vital organ functions and alters the brain functions and causes repeated seizures. The prolong rapid electrical discharges occurs in the brain cells and distributed across the lobes, causes severe contraction and relaxation of skeletal muscles few or more per a day. The release of various inflammatory cells is responsible for several electrical discharges in the brain. The seizure events originates frontal lobe followed by altered consciousness, motor activities and produces cognitive, mood disorders. The elimination of seizures depends on marking the gamma aminobutyric acid and glutamate receptors. The human brain weighs about 1,400 grams, appears like a large pinkish gray colour. Brain is surrounded by three protective layers and connected with various lobes. The nervous system is collaborated with neurons and passes the information one another and acts as a decision and communication center. Present scenario individual human population get exposed to developing the disease because of their health care issues and life style factors impacting the quality of life. The diagnosis rely on various neurological examinations and pathological studies. The management of epilepsy depends on anti epileptic medications and non medications approaches. The proper diagnosis and modification of life style factors plays a crucial role in management of epilepsy.

KEYWORDS: Contraction, Relaxation, Hemispheres, Inflammation, Electrical discharges.

INTRODUCTION
Epilepsy is a brain disorder that causes people to expose recurring seizures. The seizures occurs when group of nerve cells, or neurons, in the brain send out the wrong signals. At the
initial consequences may have strange sensations and emotions and acts strangely. They may have potent muscle spasms and lose their consciousness. It is associated with brain disorder involving reciprocated spontaneous seizures of various types having wide spectrum of problems. Basic of epilepsy address recurrent, unprovoked seizures proceeds through an uncontrolled electrical discharge from nerve cells in the cerebral cortex. Many people with epilepsy have more than one type of seizure and may have other symptoms of neurological problems as well. The human brain consist of various lobes and it is originating source for development of seizures. The symptoms of a seizure may affect any part of the body. The electrical events that produce the symptoms occur in the brain.\textsuperscript{[1-5]} It spreads all over the brain and produces unwanted health complications to the patients.

**Seizures and Epilepsy**

Seizure occurs when a burst of electrical impulses in the brain crosses it abnormal limits. They spread to neighbouring areas and create an uncontrolled disturbances of electrical activity. The electrical impulses can be transmitted to the skeletal muscles causing contraction and relaxation.

The normal pattern of neuronal activity becomes altered causing strange repeated sensations, emotions, and behavior makes convulsions, muscle spasms, and loss of consciousness.

It may develop because of an abnormality in brain and imbalance of nerve signaling like chemicals, neurotransmitters makes several changes in the vital features of brain cells causing the seizure.\textsuperscript{[7-10]}

The cells present in the brain known as neurons. It will maintain and conduct electrical signals and communicate with other cells in the brain using chemical messengers. During seizure there is an abnormal bursts of neurons firing off electrical impulses. The repeated consequences which can crop the brain and body to react strangely.\textsuperscript{[10-15]}

The severity of seizures can differ from person to person. Some people naturally experience an odd feeling with no loss of awareness, or may have a symptoms few seconds or minutes, while others lose consciousness and have convulsions.

Seizure events are a result of excessive electrical discharges in a group of brain cells and spreads different parts of the brain can causes discharges. Seizures can vary from the mild loss of attention and muscle jerks to severe and prolonged convulsions.
Types of Epilepsy
Epilepsy is generally classified into two main categories based on seizure type.

- **Partial (also called focal or localized) seizures:** These seizures are more familiar than generalized seizures and occur in one or more specific locations in the brain. In some cases, partial seizures can spread to wide regions of the brain.

- **Generalized seizures.** These seizures typically occur in both sides of the brain. These seizures are genetically based.[16-20]

Partial Seizures (Focal Seizures)

- **Simple Partial Seizures:** A person with a simple partial seizure does not lose consciousness, but may experience confusion, jerking movements, tingling, and mental and emotional events. Such events may include mild hallucinations, or extreme responses to smell and taste.

- **Complex Partial Seizures:** It is originate in the temporal lobe and spreads other parts of the brain located close to the ear. Disturbances can result in loss of judgment, involuntary or uncontrolled behavior and loss of consciousness. After a few seconds, patient may begin to perform repetitive movements, such as chewing or smacking of lips.[21-25]

Generalized Seizures
Generalized seizures are caused by nerve cell disturbances that occur in more widespread areas of the brain than do partial seizures. They are further subcategorized as tonic-clonic (or grand mal), absence (petit mal), myoclonic, or atonic seizures.[27-30]

- **Tonic-Clonic (Grand Mal) Seizures:** The first stage of a grand mal seizure is called the tonic phase, in which the muscles suddenly contract, causing the patient to fall and lie stiffly for about 10 - 30 seconds. Spasms occur for about 30 seconds to 1 minute. Then the seizure enters the second phase, called the clonic phase. The muscles begin to alternate between relaxation and rigidity. After this phase, the patient may lose bowel or urinary control.[34,35]

- **Absence (Petit Mal) Seizures:** Absence or petit mal seizures are brief losses of consciousness that occur for 3 - 30 seconds. Physical movement and loss of attention may stop for only a moment. Young children may simply appear to be staring or walking distractedly. However person may experience attacks as often as 50 - 100 times a day.[36-40]
Myoclonic seizures: These are series of brief jerky contractions of specific muscle groups, such as the face or trunk.

Atonic Seizures: Person who has an atonic (or akinetic) seizure loses muscle tone. Sometimes it may affect only one part of the body so that, for instance, the jaw falls and the head drops. At other times. The whole body may lose muscle tone, and the person can suddenly fall.[41-46]

Tonic or Clonic Seizures: In tonic seizures, the muscles contract and consciousness is altered for about 10 seconds. Clonic seizures, which are very rare, occur primarily in young children, who experience spasms of the muscles but not tonic rigidity.[47]

Brain configuration
The average human brain weighs about 1,400 grams (3 lb). It appears like a large pinkish-gray walnut. The brain can be branched middle lengthwise into two halves called the cerebral hemispheres. Each cerebral hemisphere is divided into four lobes by sulci and gyri. The sulci (or fissures) are the grooves and the gyri that can be seen on the surface of the brain. The folding created by the sulci and gyri increases the amount of cerebral cortex that can fit in the skull. In humans, the lobes of the brain are divided by a number of bumps and grooves. These are known as gyri and sulci. The folding of the brain, and the resulting gyri and sulci, increases its surface area and enables more cerebral cortex matter to fit inside the skull. The nervous system act as a decision and communication center.[48] The central nervous system is made of the brain and the spinal cord and the peripheral nervous system is made of nerves. The brain is made of three main parts includes forebrain, midbrain, and hindbrain.[49] The forebrain consists of the cerebrum, thalamus and hypothalamus. The midbrain consists of the tectum and tegmentum. The hindbrain is made of the cerebellum, pons and medulla.

Cerebrum: The cerebrum or cortex is the largest part of the human brain and associated with higher brain function such as thought and action.[50] The cerebral cortex is divided into four sections, called "lobes": the frontal lobe, parietal lobe, occipital lobe and temporal lobe.

Cerebellum: It has two hemispheres and has a highly folded surface or cortex. This structure is associated with regulation and coordination of movement, posture, and balance.

Lobes present in brain: The human brain contains the frontal, occipital, temporal and parietal lobes. The four areas in the brain function to support our thoughts and reactions and
can altered when these areas of the brain are injured.[51] The human brain is the most complex organ in the body and composed of 50 to 100 billion neurons. The brain is divided into four sections, known as lobes. The frontal lobe, occipital lobe, parietal lobe, and temporal lobe have different locations and functions that address the responses and actions of the human body.[52-57]

**Frontal Lobe:** The lobe is located in front of the central sulcus and it receives information signals from other lobes of the brain. It affairs with reasoning, planning, parts of speech and muscle movements, emotions, and problem-solving.

**Parietal Lobe:** It is present behind the central sulcus. It can entagles with perception of stimuli such as touch, pressure, temperature and pain.

**Temporal Lobe:** It is located below the lateral fissure. It Concerned with perception and recognition of auditory stimuli (hearing) and memory,[58-60] (hippocampus).

**Occipital Lobe:** It is located at the back portion of the brain behind the parietal and temporal lobes. The occipital lobe is primarily responsible for processing auditory information. Located at the back of the brain, behind the parietal lobe and temporal lobe. Concerned with aspects of vision functions and movements[61-65]

![Lobes in Brain](image)

Fig 1: Lobes present in Brain
Table 1: Causes of epilepsy

<table>
<thead>
<tr>
<th>1. Severe head injury</th>
<th>2. Brain tumors</th>
<th>3. Dementia</th>
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<tr>
<td>4. Problems during birth</td>
<td>5. Abnormal levels of sodium or blood sugar</td>
<td>6. Infections</td>
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Symptoms

Simple partial seizures

They may alter emotions or change the way things look, smell, feel, taste or sound. It includes:

Focal dyscognitive seizures (complex partial seizures); symptoms such as hand rubbing, chewing, swallowing or walking in circles.\(^{66,67}\)

- **Absence seizures**: eye blinking or lip smacking.
- **Tonic seizures**. Tonic seizures cause stiffening of muscles.
- **Atonic seizures** loss of muscle control, which may cause you to suddenly collapse or fall down.
- **Clonic seizures**. Clonic seizures are associated with repeated or rhythmic, neck, face and arms jerking muscle movements.
- **Myoclonic seizures**. Myoclonic seizures usually appear as sudden brief jerks or twitches of your arms and legs.\(^{68-70}\)
- **Tonic-clonic seizures** loss of consciousness, body stiffening and shaking, and sometimes loss of bladder control or biting tongue.

For focal onset seizures

- **Motor symptoms** There may also be automatisms or repeated automatic movements, like clapping or rubbing of hands, lipsmacking or chewing, or running.\(^{71}\)

The other symptoms includes

- Lack of bowel or bladder control, confused memory, fever.
- Person is unresponsive to instructions.
- The person suddenly falls for no clear reason.
- Sudden bouts of blinking without apparent stimuli.
- Sudden bouts of chewing, without any apparent reason.
• For a short time unable to communicate. [72]
• The person becomes fearful for no apparent reason, panic.
• Peculiar changes in senses, such as smell, touch, and sound.

Risk factors
Certain factors may increase risk of epilepsy includes.

• **Age**: The onset of epilepsy is most common during early childhood and after age 60.
• **Family history**: Family history of epilepsy increased risk of developing a seizure disorder. [73]
• **Head injuries**: Head injuries are responsible for some cases of epilepsy.
• **Stroke and other vascular diseases**: Stroke and other blood vessel (vascular) diseases can lead to brain damage that may trigger epilepsy.
• **Dementia**: Dementia can increase the risk of epilepsy in older adults.
• **Brain infections**: Infections such as meningitis, which causes inflammation in brain or spinal cord, can increase risk. [74]
• **Seizures in childhood**: High fevers in childhood can sometimes be associated with seizures. [75]

Pathogenesis
Normally brain electrical activity is controlled by various factors. Inhibitory neurons not functioning properly. This results in a specific area from which seizures may develop. The epilepsy may occurred due to up regulation of excitatory circuits or down-regulation of inhibitory circuits following an injury to the brain. The excitation of a group of nerves and caused by inward currents of Na, Ca and involvement of excitatory neurotransmitters like Glutamate and Aspartate. Epileptogenesis and hyperexcitability of neurons that facilitate to spread all parts of the brain. [76] The cortical and subcortical structures are involved in generating a seizure. Normally after an excitatory neuron firing for a period of time causes epilepsy. [75]

Some of the epilepsy syndromes include

**Benign rolandic epilepsy**
This is an epilepsy that is idiopathic and typically begins in children between 3 and 13 years of age. There are simple partial seizures that involve facial muscles and are frequently associated with excessive salivation and face drooling. The EEG shows spike discharges that occur over the central part of scalp over the central sulcus of the brain. [77]
Benign occipital epilepsy of childhood
This is an idiopathic epilepsy with an evolving group of syndromes. There are two subtypes. One of them is early and occurs between 3–5 years of age and another late onset that occurs between 7–10 years. Seizures may affect half of the body with eye deviation or head turning.

Temporal lobe epilepsy
This is another symptomatic epilepsy and is most common in adults. In most cases the region of problem region is found in the midline temporal structures like hippocampus, amygdala, and parahippocampal gyrus.[78]

Frontal lobe epilepsy
This is a cryptogenic epilepsy. It appears from lesions causing seizures that occur in the frontal lobes of the brain.

Catamenial epilepsy
This is a syndrome of epilepsy that affects women around their menstrual cycle.[79]

Childhood absence epilepsy
This is also called idiopathic generalized epilepsy that affects children between the ages of 4 and 12 years of age. The absence seizures are brief episodes of unresponsive staring with features such as blinking or chewing movements. The typical EEG feature is 3 Hz spike and wave discharges. Sometimes the seizure may be generalized.

Juvenile absence epilepsy
This is another idiopathic generalized epilepsy with later onset of childhood absence epilepsy. The features are similar.

Dravet's syndrome
This is characterized by severe myoclonic seizures. This is a generalized epilepsy. It starts in the first year of life. There may be fetal hemiclonic epilepsy with clonic seizures of one half of the body. Males are affected more than females.[80]

Lennox-Gastaut syndrome (LGS)
There are three features of this epilepsy syndrome - developmental delay with childhood dementia, mixed generalized seizures, and EEG demonstrating 2 Hz slow spike-wave pattern. It is an idiopathic, symptomatic, or cryptogenic epilepsy. There may be different types of
seizures with common occurrence of astatic seizures (drop attacks), tonic seizures, tonic-clonic seizures, atypical absence seizures and complex partial seizures.

**Progressive myoclonic epilepsies**
These include groups of symptomatic generalized epilepsies with progressive dementia and myoclonic seizures. This includes Unverricht-Lundborg disease, Lafora disease, neuronal ceroid lipofuscinosis, and sialdosis.

**Rasmussen's encephalitis**
This is another localization-related epilepsy which occurs due to a progressive, inflammatory lesion in children below age 10 years.

**West syndrome**
It starts between 3 months and 2 years of age. There may be idiopathic. The most common cause is tuberous sclerosis.

**Diagnosis**
Diagnose rely on review of symptoms and medical history of the person.

**The tests that may be done include**
- Blood chemistry
- Blood sugar
- Kidney function tests
- Liver function tests
- Lumbar puncture
- Microbial culture test
- **Electroencephalogram (EEG).** This is the most common test used to diagnose epilepsy. In this test attachment of electrodes to scalp with a paste-like substance. The electrodes record the electrical activity of brain.
- **Computerized tomography (CT) scan.** A CT scan uses X-rays to obtain cross-sectional images of your brain. CT scans can reveal abnormalities in the brain that might be causing your seizures, such as tumors, bleeding and cysts.
- **Magnetic resonance imaging (MRI):** An MRI uses powerful magnets and radio waves to create a detailed view of brain.
**Functional MRI (fMRI).** A functional MRI measures the changes in blood flow that occur when specific parts of brain are working. It may may applicable to an fMRI before surgery to identify the exact locations of critical functions, such as speech and movement, so that surgeons can avoid injuring those places while operating.

**Positron emission tomography (PET):** The test associated with small amount of low-dose radioactive material that's injected into a vein to help visualize active areas of the brain and detect abnormalities.

**Single-photon emission computerized tomography (SPECT).** This type of test is used primarily failure of results from MRI and EEG that address location in brain where the seizures are originating. This test uses a small amount of low-dose radioactive material that's injected into a vein to create a detailed, 3-D map of the blood flow activity in brain during seizures.

**Epidemiology**

70 million persons with epilepsy (PWE) worldwide, nearly 12 million patients are expected to reside in India which contributes to nearly one-sixth of the global burden. Approximately 50 million people worldwide have epilepsy and progressing one of the most common neurological diseases globally. Nearly 80% of the people affected with epilepsy live in low and middle-income countries.

**Complications of Epilepsy**

Complications of complex partial seizures are easily triggered by emotional stress. The limbic structures of the brain may be damaged by seizure activity. The limbic system is connected with emotion and motivation.

**These patients may develop cognitive and behavioral difficulties, such as following.**

- **Interictal personality:** humorlessness, dependence, obsessions, anger, hypo- or hypersexuality, emotionality.
- **Memory loss:** short-term memory loss attributable to dysfunction in the hippocampus, anomia.
- **Violent behavior:** Aggression and defensiveness when subjected to restraint during a seizure.
- Aspiration of secretions or vomited stomach contents.
- Skull or vertebral fractures, shoulder dislocation.
- Tongue, lip, or cheek injuries caused by biting.
• Cardiac arrhythmias
• Myocardial infarction
• Head trauma
• Pulmonary edema (fluid build-up in the lungs)

**Sudden unexplained death in epilepsy**

It happens persons with symptomatic epilepsy have a much greater risk. It is possible that pulmonary edema (fluid build-up in the lungs), suffocation, or cardiac arrhythmias (irregular heartbeat) may be responsible.

**Prevention of Epilepsy**

**Lifestyle Changes**

The best preventive measure is to comply strictly with the drug regimen as prescribed. Seizures cannot be prevented by lifestyle changes alone, but people can make behavioral changes that improve their lives and give them a sense of control.

**Avoiding Epileptic Triggers**

- Using sleep hygiene or other methods to improve sleep may be helpful.
- Consuming the food, diet free from allergic materials and it varies with individual population.
- Alcohol and smoking should be avoided.
- Patients should avoid exposure to flashing or strobe lights.
- Relaxation methods include deep breathing, biofeedback, and meditation techniques is applied to patients with epilepsy.

**Exercise:** Exercise is important for many aspects of epilepsy and keeps healthy physically and mentally healthy.

**Dietary Measures:** All patients should maintain a healthy diet, including plenty of whole grains, fresh vegetables, and fruits. In addition, dairy foods may be important to maintain calcium levels.

**The Ketogenic Diet:** The ketogenic diet, which is very high in fat (90%), very low in carbohydrates, and low in protein, has been studied and debated for decades.
Effects of epilepsy in adults: People with epilepsy have a high risk for suicide. The rising risk for suicide is highest among people who have epilepsy and an accompanying psychiatric condition such as depression, anxiety disorder, schizophrenia, chronic alcohol use.

First-line and second-line drugs
First-line drugs are older and have treated epilepsy for decades. Second-line drugs are much newer.
The first line AEDs include: Sodium valproate, Carbamazepine, Phenytoin, Phenobarbital.

Newer second-line AEDs include
Gabapentin, Lamotrigine, Levetiracetam, Oxcarbazepine, Tiagabine, Topiramate, Vigabatrin.

Side effects of epileptic drugs: Dizziness, Balance Problems, Allergic Rashes, Bleeding Disorders, Gum problems and gum Swellings, Weight gain, acne.

Surgery
Surgery is increasingly used as treatment for refractory focal epilepsy. There are techniques by which the location of epileptic discharge is found and neurosurgical techniques are applied to achieve a possible cure.

Surgical operations for epilepsy include
- Antero medial temporal resection
- Corpus callosotomy
- Multiple subpial transaction
- Vagus nerve stimulator (VNS)
- Deep brain stimulation (DBS) therapy is also a surgical treatment for epilepsy. DBS involves implanting electrodes into specific areas of the brain to control seizures.

Generic names

<table>
<thead>
<tr>
<th>Acetazolamide</th>
<th>Levetiracetam</th>
<th>Retigabine</th>
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<tbody>
<tr>
<td>Carbamazepine</td>
<td>Nitrazepam</td>
<td>Rufinamide</td>
</tr>
<tr>
<td>Clobazam</td>
<td>Oxcarbazepine</td>
<td>Sodium valproate</td>
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<tr>
<td>Clonazepam</td>
<td>Perampanel</td>
<td>Stiripentol</td>
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<td>Eslicarbazepine acetate</td>
<td>Piracetam</td>
<td>Tiagabine</td>
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<td>Ethosuximide</td>
<td>Phenobarbital</td>
<td>Topiramate</td>
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<td>Gabapentin</td>
<td>Phenytoin</td>
<td>Vigabatrin</td>
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<td>Lacosamide</td>
<td>Pregabalin</td>
<td>Zonisamide</td>
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<tr>
<td>Lamotrigine</td>
<td>Primidone</td>
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### Brand names (available as)

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<td>Carbogen</td>
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<td>Diaocmit</td>
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<td>Diamox SR</td>
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<td>Emeside</td>
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<td>Epanutin</td>
<td>Lyrica</td>
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<td>Epilim</td>
<td>Neurontin</td>
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<td>Epilim Chrono</td>
<td>Nootropil</td>
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### Seizure types

<table>
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<th>Seizure type</th>
<th>Drug treatment</th>
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<td>1.</td>
<td>Absence seizures</td>
<td>Clonazepam, Ethosuximide, Sodium valproate</td>
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<tr>
<td>2.</td>
<td>Atonic seizures</td>
<td>Phenobarbital, Phenytoin, Sodium valproate</td>
</tr>
<tr>
<td>3.</td>
<td>Catamenial seizures (menstrual-related)</td>
<td>Clobazam</td>
</tr>
<tr>
<td>4.</td>
<td>Cluster seizures</td>
<td>Clobazam</td>
</tr>
<tr>
<td>5.</td>
<td>Focal (partial) seizures</td>
<td>Tiripentol</td>
</tr>
<tr>
<td>6.</td>
<td>Generalised tonic clonic seizures</td>
<td>Carbamazepine, Lamotrigine, Oxcarbazepine</td>
</tr>
<tr>
<td>7.</td>
<td>Infantile spasms</td>
<td>Sodium valproate, Vigabatrin</td>
</tr>
<tr>
<td>8.</td>
<td>Juvenile Myoclonic Epilepsy</td>
<td>Levetiracetam</td>
</tr>
<tr>
<td>9.</td>
<td>Myoclonic seizures</td>
<td>Clonazepam, Phenobarbital, Phenytoin</td>
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**Figure 2: Mechanism of action of anti epileptic drugs**

- [Mechanism of action of anti epileptic drugs diagram](#)
Narrow spectrum anti epileptic drugs

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<tr>
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<tbody>
<tr>
<td>Carbamazepine</td>
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<td>Methsuximide</td>
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<tr>
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<td>Ethosuximide</td>
<td>Oxcarbazepine (Trileptal,)</td>
<td>Rufinamide (Banzel)</td>
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<tr>
<td>Diazepam</td>
<td>Gabapentin</td>
<td>Phenobarbital</td>
<td>Tiagabine (Gabitril)</td>
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<tr>
<td>Divalproex (Depakote)</td>
<td>Lacosamide</td>
<td>Phenytoin (Dilantin)</td>
<td>Vigabatrin (Sabril)</td>
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CONCLUSION
Epilepsy is a chronic neurological disorder characterized by repetitive seizures and is often associated with cognitive deficits and mood disorders. The deep brain stimulation techniques and vagus nerve stimulation procedures, stress relaxation therapies may delays the seizures origin.

Effective treatment that prevents the motor, cognitive defects and psychological defects in the patients. Establishment of advanced medical scanning, early detection techniques allows to improve the health surveillance. Modification of life style factors and early detection of risk factors are beneficial to the population. Implementing the special awareness care programmes, knowledge about disease prevention and management with in the community reduce the disease progress in the future.

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