

CONTENTS

1. WHAT IS EPILEPSY?
2. HOW COMMON IS EPILEPSY?
3. WHY DOES IT MATTER?
4. WHAT CAUSES EPILEPSY?
5. WARNING SIGNS?
6. TRIGGERS
7. SIDE EFFECTS OF EPILEPSY
8. FIRST AID FOR EPILPESY
9. TYPES OF SEIZURES
10. HELP AND SUPPORT

WHAT IS EPILEPSY?

A neurological disorder marked by sudden recurrent episodes of sensory disturbance, loss of consciousness, or convulsions, associated with abnormal electrical activity in the brain.

HOW COMMON IS EPILEPSY?

Epilepsy is the most common, serious neurological disorder worldwide. More than half a million people in the UK have epilepsy, which equates to 1 in 100 people. Epilepsy can affect anyone, of any age, race, or sex, at anytime from any walk of life.

WHY DOES IT MATTER?

Epilepsy is the 4th most common neurological condition.
40 Types of Epilepsy.

Around the world an estimated 65 million people have epilepsy at any given time.

There are 600,000 people suffering from epilepsy in the UK.

In the West Midlands 53,000 suffer from epilepsy.

1 in 10 will have a seizure in their lifetime.

Approximately 1 in 26 people will develop epilepsy at some point in their lifetime.

WHAT CAUSES EPILEPSY?

In over half all epilepsy cases, the cause is unknown. A short list of instances, which may cause a seizure or lead a person to epilepsy includes;

- Head Injury.
- Brain infection.
- Brain tumours.
- Stroke.
- Alzheimer's
- Arteriosclerosis.
- Alcohol Abuse.
- Drug Abuse.
- Trauma during birth.
- High fever mainly in children.
- Certain medications.

WARNING SIGNS?

Simple partial seizures are where you remain fully conscious throughout. These seizures are sometimes known as “warnings” or “auras”, because they can be a sign that another type of seizure is on its way. This may give you time to warn people around you and make sure you are in a safe place. Symptoms of a simple partial can include:

- A general strange feeling that is hard to describe.
- “Rising” feeling in your tummy – sometimes likened to the sensation in your stomach when on a fairground ride.
- An intense feeling that events have happened before (*déjà’ vu*).
- Experiencing an unusual smell or taste.
- A tingling sensation, or “pins and needles”, in your arms and legs.
- A sudden intense feeling of fear of joy.

- Stiffness or twitching in part of the body, such as an arm or hand.

TRIGGERS?

Not everyone has an identifiable seizure trigger. In many cases, though, seizures can be triggered by a number of factors. However you can monitor the types of trigger factors by keeping a seizure diary for a period of time. Types of triggers include:

- Forgotten or incorrect medication.
- Fever/infections.
- Lack of Sleep.
- Stress of excitement.
- Boredom.
- Alcohol.
- Drugs (prescription and recreational).
- Flickering lights.
- Startle response.
- Menstruation.
- Ovulation.
- Constipation

SIDE EFFECTS OF EPILEPSY

The most common side effects include dizziness, nausea, headache, vomiting, fatigue, vertigo, ataxia, blurred vision, poor co-ordination, weight gain, double vision, stressed, weight gain, depression anxiety, confusion, irritability, and tremor.

FIRST AID FOR SEIZURES

Do

Remove harmful objects nearby

Cushion their head

Aid breathing by gently placing in recovery position

Don't

Restrain the person's movement

Put anything in the person's mouth

Give them anything to eat and drink, until they are fully recovered

TYPE OF SEIZURES

1. Absence Seizure ("Petit Mal")

Absence seizures account for 2-4 percent of epilepsy. They are characterized by brief episodes of staring, usually lasting only 2-10 seconds and may happen repeatedly during the day. There is no warning before a seizure and the person is completely alert afterwards, with no memory of it. Because they are so mild, you might not even realize you had one and it's easily not noticed by those around you.

2. Aicardi Syndrome

A rare inherited (genetic) disorder in which the structure that connects the two sides of the brain (corpus callosum) is partly or completely missing.

3. Alice in Wonderland Syndrome (Micropsia)

Children with Alice in Wonderland Syndrome (or AIWS) feel that their body is changing, because of migraines and headaches. They don't just see themselves changing in size, though, but they also see other people, animals and objects look larger or smaller than they actually are. They can also feel that their hearing and sense of touch have changed.

4. Atonic Seizures (Drop Attacks)

Without warning, a person will abruptly loses consciousness, collapse and fall to the floor. Your head may drop suddenly, your eyelids may droop, your head may nod, and you may drop things. Recovery occurs after a few seconds. You regain consciousness, and can again stand and walk.

5. Atypical Absence Seizures

The person will stare (as they would in any absence seizure) but often is somewhat responsive. You may experience eye blinking or slight jerking movements of the lips.

6. Autonomic Seizures

These seizures are accompanied by autonomic symptoms or signs, such as abdominal discomfort or nausea which may rise into the throat, stomach pain, the rumbling sounds of gas moving in the intestines belching, flatulence and vomiting. This has sometimes been referred to as abdominal epilepsy. Other symptoms may include pallor, flushing, sweating, hair standing on end, dilation of the pupils, alterations in heart rate and respiration, and urination. A few people may experience sexual arousal, penile erection, and orgasm.

7. Benign Rolandic Epilepsy (Sylvan Seizures or Benign Partial Epilepsy of Children)

Accounts for more than one-third of epilepsy beginning in middle childhood between ages 3 and 13. Seizures usually occur infrequently in children, as generalized nocturnal seizures characterized by a variety of minor tonic-clonic movements and often affect only one side of the face. A typical attack involves twitching, numbness, or tingling of the child's face or tongue (a partial seizure), which often interferes with speech and may cause drooling There's a jerking of the corner of the mouth that may spread to the

rest of that side of the face, causing a twisting motion. The child usually does not lose consciousness, except in cases of secondarily generalized seizures of this type. In rare cases, the seizure may progress to encompass the entire side of the body, becoming a generalized tonic-clonic condition. Seizures typically occur at night and these children are otherwise normal and healthy. The prognosis is favorable with 95% of children outgrowing their seizures by age 15.

8. Catamenial Seizures

Catamenial epilepsy (CE), also known as menstrual seizures, is linked to a woman's menstrual cycle and related hormone levels in the body. Women with CE often have more seizures during certain times of their cycle. This may include:

- Just before or during menstruation, or period.
- During ovulation, the time during the cycle when an egg moves from the ovary and can be fertilized.

Women with CE will generally have seizures throughout their cycle. However, the number of seizures will often increase during a certain time.

9. Clonic Seizures

During a clonic seizure, you may lose control of bodily functions and begin jerking rhythmically in various parts of your body. Consciousness may be temporarily lost and followed by confusion. Clonic seizures begin in early childhood. With time, clonic seizures may eventually progress to generalized tonic-clonic seizures.

10. Complex Partial Seizures (Psychomotor or Temporal Lobe Seizures)

Begins with a blank look or empty stare. You may be unaware of your surroundings and seem dazed and confused. The seizure may progress to include chewing movements, mumbling, uncoordinated activity, or sometimes performing meaningless bits of behaviour, which appear random and clumsy. These may include picking at

your clothes, trying to remove them, walking about aimlessly, picking up things, or mumbling. Following the seizure, there will be no memory of it. A complex partial seizure usually lasts about 2 to 4 minutes. It may be followed by a longer lasting confusion.

11. Dravet Syndrome — Severe Myoclonic Epilepsy of Infancy

(SMEI), is a severe form of epilepsy. It appears during the first year of life with frequent febrile seizures – fever-related seizures that, are rare beyond age 5.

Children with Dravet syndrome typically experience poor development of language and motor skills, hyperactivity, and difficulty relating to others.

12. Eclampsia

Eclampsia is a severe complication of preeclampsia. It's a rare but serious condition where high blood pressure results in seizures during pregnancy. Seizures are periods of disturbed brain activity that can cause episodes of staring, decreased alertness, and convulsions (violent shaking).

13. Ecstatic Seizures

Also called Dostoyevsky's Epilepsy, are a type of seizure activity that is characterized by feelings of ecstasy or transcendent joy. Mystical, spiritual, and hallucinatory experiences often occur as well. The temporal lobe is effected by the seizure activity and provides a neural basis for these experiences. These seizures can involve more than one seizure symptom, such as tonic-clonic, tonic & more.

14. Febrile Seizures

Children aged 3 months to 5 years may have febrile seizures when they have a high fever. This occurs in only 2% to 5% of all children. A febrile seizure is usually mild and brief, often resulting in a slight slumping and loss of consciousness, or a rolling of the eyes back in the head. Sometimes there may be

convulsive stiffening and jerking, but there is no need to panic. Protect the child from sharp, hot, or otherwise dangerous objects. Loosen tight clothing. Do not put anything in the child's mouth. Do not restrict his/her movements. Roll the child on his/her side and try to keep everyone relaxed.

15. Complex Febrile Seizures

May be more threatening. They can last longer than 15 minutes and although only one side of the body is affected during a complex febrile seizure, neurological reports may indicate abnormalities.

Febrile seizures pose no threat of mental retardation, cerebral palsy, learning disabilities, or death. The incidence of febrile seizures does not indicate a possibility of developing long-term epilepsy. Febrile seizures are classed as incidents rather than as a condition.

16. Focal Cortical Dysplasia

This is the most common cause of intractable epilepsy in children and is a frequent cause of epilepsy in adults. Focal cortical dysplasias (FCD) are localized regions of malformed cerebral cortex. They are a common cause of focal seizures. Onset of seizures can be at any age, with two thirds having seizure onset by 5 years of age and most patients having seizure onset by 16 years. Older age of onset is rarely seen.

17. Frontal Lobe Epilepsy

May produce weakness or inability to use certain muscles, including those that govern speech. Frontal lobe seizures may involve thrashing movements during sleep, also stiffening with the head turned to one side and the arm rising into a brief frozen state. Some seizures may be dramatic and upsetting to others, with screaming, bicycling movements of the legs, running. Treatment is with medication, and, in some cases, surgery.

18. Gelastic Seizures

These seizures are both unpredictable and unprovoked by the person's surroundings. They are abrupt in onset and quickly over. They may occur nocturnally, waking you from sleep and leaving you exhausted. Basically, they are characterized by brief outbursts of emotion, usually in the form of a laugh or a cry. They may be accompanied by forced eye movements, chewing or grinding the teeth, tonic posturing, and clonic jerking. You may appear confused and/or dazed during and after an episode. Gelastic seizures usually last 5 to 60 seconds and you may remember them clearly or may be completely unaware of what occurred.

19. Infantile Spasms (West Syndrome)

These consist of a cluster of sudden jerks followed by stiffening. Often the arms are flung out as the knees are pulled up and the body bends forward.

Infantile spasms consist of clusters of sudden, quick movements. Typically, if the child is sitting up, the head may fall forward, the arms will flex forward, and the body may flex at the waist. If lying down, the knees will be drawn up, with arms and head flexed forward as if the body is reaching for support. Individual spasms last only 1 or 2 seconds. They often repeat in a series of 5 to 50 or more. A child may have many series per day. Spasms are most likely to occur when the child is drowsy, just waking from a nap or falling asleep. They're sometimes called "jackknife seizures" and are very rare. They occur only during the first year of life, usually starting around 3-7 months of age.

20. Jacksonian Seizure (Also called Jacksonian March)

A kind of simple partial seizure. "Simple" in this context means patients do not lose awareness. Partial means that abnormal neuron firing only occurs in part of the brain, and, accordingly, abnormal movement or sensation is limited to only part of the body. The characteristic features of Jacksonian march are that it only occurs on one side of the

body and it progresses in a predictable pattern from twitching or a tingling sensation or weakness in a finger, a big toe or the corner of the mouth, then marches over a few seconds to the entire hand, foot or facial muscles.

Jacksonian march seizures are generally brief and relatively mild. They are episodic, come and go. There is no confusion afterwards. Sometimes patients may not even notice them.

21. Juvenile Myoclonic Epilepsy

Typically begins at puberty in otherwise healthy children.

The first symptom is usually a generalized convulsion. These children may also have myoclonic seizures (jerking of the muscles) on awakening. A hand may suddenly fling out, a shoulder may shrug, a foot may kick, or the entire body may jerk. A child may spill or drop whatever he or she is holding or fall from their chair. Absence seizures may also occur.

Juvenile myoclonic seizures can occur as a single event or in a series.

22. Lafora Disease

Is a severe form of epilepsy, characterized by seizures and progressive neurological degeneration. It occurs during late childhood or early adolescence. Death usually occurs within 10 years of the first symptoms.

23. Landau-Kleffner Syndrome

Also a rare disorder beginning between ages of 3 and 7.

Produces seizures and affects speech. Children develop normal speech, and then slowly lose it. Simple partial and tonic clonic seizures. Treated with antiepileptic drugs to control seizures, and, possibly, steroids.

24. Lennox-Gastaut Syndrome

Lennox-Gastaut syndrome (LGS) is a rare and severe kind of epilepsy that starts in childhood. Children with LGS have seizures often, and they have several different kinds of seizures.

The seizures usually start between ages 2 and 6. Children with LGS have learning difficulties and developmental delays (like sitting, crawling, walking) that can be moderate to severe. They can also have behavioural problems.

Each child develops differently, and it's impossible to predict how a child with LGS will do. While most children have ongoing seizures and some form of learning disability, some may respond well to treatment and have fewer seizures.

Others may continue to have seizures often, as well as problems with thinking, development, and behaviour, and will need help with daily living activities. Some parents find that a special diet, called the ketogenic diet, helps.

25. Limbic Epilepsy

Limbic areas are regions in the temporal and frontal lobes, which are involved with memory and emotion and this is a seizure happening in this area.

26. Motor Seizures

They are a form of simple partial seizures, which include clonic, jerking, convulsive movements. Jerking typically begins in one area of the body – your face, arm, leg, or trunk — and may spread to other parts of the body. These seizures are sometimes called Jacksonian motor seizures, their spread is called a Jacksonian march and they cannot be stopped.

27. Multifocal Seizures

While most seizures can be neatly split into partial and generalized, there exists some that don't fit. For example: the seizure may be generalized only within one hemisphere. Alternatively there may be many focal points (multifocal seizures) that are distributed in a symmetrical or asymmetrical pattern.

28. Musicogenic Seizures

Certain types of music or even specific frequencies of pitch for which your brain has a low threshold or tolerance trigger this reflex epilepsy. They usually involve a degree of cognitive or emotional appreciation of the stimulus. This usually results in a complex partial seizure, but may also induce others, such as tonic-clonic seizures. Sensitivity to music varies from person to person. Some people are sensitive to a particular tone from a voice or instrument. Others are sensitive to a particular musical style or rhythm. Still others are sensitive to a range of noises.

29. Neonatal Seizures

Neonatal seizures occur in babies soon after birth. As many as 1.5 to 2.5% of newborns have seizures in the first month of life. A further 20% of all seizures in children under 3 years of age have neonatal seizures. They're generally classified as subtle, clonic, tonic, and myoclonic.

Subtle attacks are characterised by apnoeas with episodes of pallor, fixed staring, deviation of one or both eyes, eye blink, motor changes, episodic chewing movements, or stereotypic limb movements such as swimming or bicycling motions. Drooling and unusual alertness may accompany neonatal seizures. Usually, most neonatal seizures occur over only a few days and fewer than half of affected infants develop seizures later in life.

30. Nocturnal Seizures

These are usually tonic-clonic. They might occur just after a person has fallen asleep, just before waking, during daytime sleep, or while in a state of drowsiness. People who experience nocturnal seizures may find it difficult to wake up or to stay awake. Although unaware of having had a seizure while asleep, they may arise with a headache; have temper tantrums, or other destructive behaviour throughout the day.

31. Partial (Focal) Seizure

Partial (focal) seizures occur when this electrical activity remains in a limited area of the brain. The seizures can sometimes turn into generalized seizures, which affect the whole brain. This is called secondary generalization.

Partial seizures can be divided into:

- Simple, not affecting awareness or memory
- Complex, affecting awareness or memory of events before, during, and immediately after the seizure, and affecting behaviour.

32. Pattern — Sensitive Epilepsies

In this reflex condition, seizures are produced by particular visual patterns. These triggers may consist of circles, stripes, or other patterns, usually of high contrast. Moving patterns are most likely to incite a seizure.

33. Photosensitive Epilepsy

If you have photosensitive epilepsy, certain types of flickering or flashing light may incite a seizure. The trigger could be exposure to television screens due to the flicker or rolling images, computer monitors, certain video games or TV broadcasts containing rapid flashes, even alternating patterns of different colours, in addition to intense strobe lights. And surprisingly, seizures may be triggered by natural light, such as sunlight, especially when shimmering off water, even sun flickering through trees or through the slats of Venetian blinds.

34. Post Traumatic Seizures

Seizures may develop immediately after an injury to the brain or may develop in delayed fashion, showing up months or years after the initial trauma. Generally speaking, the risk of post traumatic seizures is related to the severity of the injury. The greater the injury, the higher the risk of developing seizures. Even mild to moderate injuries can result in seizures.

35. Primary Reading Epilepsy

This is reflex epilepsy where seizures are triggered by reading. Seizures usually begin in adolescence, and onset is unusual in younger children or adults over 30 years old. Patients report jaw jerking or clicking while reading, often with jerks of the arms, and if reading continues, a generalized convulsion may occur. Transient cognitive impairment has also been noted with the jerks.

36. Progressive Myoclonic Epilepsy

A rare, form of epilepsy with myoclonic (jerking) and tonic-clonic (grand mal) seizures. Children with this condition may have trouble with maintaining balance and experience rigid muscles. There is also a loss of mental ability.

37. Psychogenic Seizures (PNES or “Pseudo Seizures”)

Psychogenic seizures are not due to epilepsy. Psychogenic seizures can occur at any age, but are more common in people under the age of 55. They occur three times more frequently in women than men. They may arise from various psychological factors, may be prompted by stress, and may occur in response to suggestion.

Some individuals with psychogenic non-epileptic seizures may have previously experienced trauma, such as sexual abuse.

38. Rasmussen’s Encephalitis — also Chronic Focal Encephalitis (CFE)

This is a rare, progressive neurological disorder, which affects one half of the brain, producing severe seizures, loss of motor control and speech along with paralysis on one side of the body, inflammation of the brain and dementia.

39. Reflex Epilepsy

A small number of people have what is known as reflex epilepsy, in which seizures are set off by specific stimuli. These can include flashing lights, a flickering

computer monitor, sudden noises, a particular piece of music, or the phone ringing. Some people even have seizures when they think about a particular subject or see their own hand!

40. Secondarily Generalized Seizures

Secondarily generalized seizures begin in one part of the brain, either as a simple partial seizure (last less than one minute and the person may show different symptoms depending upon which area of the brain is involved) or complex partial (commonly occur in the temporal lobe of the brain), and then spread to involve both sides of the brain where consciousness is lost. Clinically, it looks exactly like a generalized tonic clonic seizure (when a burst of electrical energy sweeps through the whole brain at once, causing a loss of consciousness, falls, and convulsions).

41. Simple Partial Seizures (Focal Seizures)

A partial (focal) seizure happens when unusual electrical activity affects a small area of the brain. When the seizure does not affect awareness, it is known as a simple partial seizure.

Simple partial seizures can be affecting the muscles of the body, affecting the senses, affecting automatically controlled functions and affecting feelings or thoughts

Simple focal seizures are also known as auras. Symptoms of simple partial seizures are: Muscle tightening, Unusual head movements, Blank stares, Eyes moving from side to side, Numbness, Tingling, Skin crawling (like ants crawling on the skin), Hallucinations- seeing, smelling, or hearing things that are not there, Pain or discomfort and Nausea

42. Sensory Seizures

Some simple partial seizures consist of a sensory experience. People with sensor seizures may smell or taste things that aren't there, hear clicking, ringing, or a person's voice when there is no actual sound. You may also see lights, hear a

buzzing sound, or feel tingling or numbness in a part of the body. Simple partial seizures usually last just a few seconds, although they may be longer. If there are no convulsions, they may not be obvious to those around you.

43. Startle Epilepsy

This is a type of reflex epilepsy in which seizures are provoked by loud noises or sudden surprises. Most patients with startle epilepsy are only sensitive to one sensory modality (i.e. temperature, taste, sound, pressure); however, it is the unexpected nature of the stimulus, rather than the sensory modality, that characterizes startle epilepsy. These seizures usually last less than 30 seconds. The seizure begins with a startle response, followed by a brief tonic phase. Patients sometimes fall to the ground and experience clonic jerks. Responsiveness to the stimulus decreases as a result of repeated exposure to the stimulus. Spontaneous seizures also occur in patients with startle epilepsy, but are infrequent in most cases.

People with startle epilepsy usually have static cerebral lesions and developmental delay. For many people, half of the body is partially paralysed and it is the weak side of the body that is primarily involved in the startle seizures. Startle epilepsy is often associated with disorders such as Down syndrome and cortical dysplastic lesions.

44. Status Epilepticus

Status epilepticus is defined as:

- Continuous seizure activity for 5 minutes or more without return of consciousness, or
- Recurrent seizures (2 or more) without an intervening period of neurological recovery

45. Temporal Lobe Epilepsy

Temporal lobe epilepsy (TLE) is a type of epilepsy causing focal seizures beginning in the temporal lobe area of the brain. One or both lobes may be affected. There may be

an aura warning sign before a seizure, but not everyone will experience this. Temporal lobe epilepsy may cause either simple partial seizures without loss of awareness or complex partial seizures with a loss of awareness.

46. Tonic Seizures

Tonic seizures are characterised by facial and muscle spasms of your trunk, flexing or reaching of your upper and lower extremities, and impaired consciousness. Several types of tonic seizures exist. Those grouped with absence, myoclonic, and atonic seizures are non-convulsive and tend to be brief. The more prolonged seizures usually are convulsive and may manifest dilation of your pupils, tachycardia, apnoea, a bluish tinge to your skin, salivation, and the loss of bladder or bowel control. Tonic seizures are often followed by postictal confusion.

47. Tonic-Clonic Seizures (“Grand Mal”)

In a generalized tonic-clonic (grand mal) seizure, you will probably give out a short cry and fall to the floor. Your muscles will stiffen during the tonic phase and then, during the clonic phase your extremities will jerk and twitch. Often you will lose consciousness, stop breathing or have difficulty breathing, turn blue and lose bladder control which is not uncommon, but extremely embarrassing.

Afterwards, you may feel tired, confused and disorientated. This may last from 5 minutes to several hours or even days. Rarely, this disorientation may last up to 2 weeks. You may be asleep, or gradually become less confused until full consciousness is regained.

48. Vertigo Epilepsy

While epilepsy is commonly accompanied by dizziness or vertigo, vertigo is only rarely caused by epilepsy. This arises primarily because vertigo is much more commonly caused by ear conditions. Epileptic vertigo is due to brain injury, typically the part of the temporal lobe that processes

vestibular signals. Loss of consciousness usually occurs at the time of injury. The typical symptom is “quick spins.”

49. Withdrawal Seizures

This type of seizure is seen when certain medications, such as barbiturates and benzodiazepines, are stopped abruptly. In this case, continued treatment with antiepileptic medications is usually not advisable. Withdrawal seizures are common when a person with alcoholism is trying to quit drinking. If a person with epilepsy drinks alcohol heavily and experiences withdrawal seizures, it is difficult for the physician or specialist to determine the exact cause of the seizure and to determine the next appropriate step. Therefore, it is important to avoid alcoholic beverages once you begin taking antiepileptic medications.

HELP AND SUPPORT

Epilepsy Action, 0808 800 5050: Confidential advice and information from trained staff, on diagnosis, medication, driving, pregnancy and other issues related to living with epilepsy.

Epilepsy Society, 01494 601400: For people with epilepsy, their families, friends, carers, employers, GPs, nurses, healthcare professionals, schools, students...

Epilepsy Research UK, 020 8747 5024: Funds independent research into the causes, treatment, prevention and impact of epilepsy throughout the UK.

Young Epilepsy, 01342 832 243: To create better futures for young lives with epilepsy and associated conditions.

Matthew Friends, 01342 836 571: To publicise Ketogenic Dietary Therapies and make them more

available to all those who should need them, be it child or adult.

Sudep Action, 01235 772 850: SUDEP Action is dedicated to raising awareness of epilepsy risks and tackling epilepsy deaths including Sudden Unexpected Death in Epilepsy. We are the only UK charity specialised in supporting and involving people bereaved by epilepsy.

Brain and Spine Foundation, 0808 808 1000: A service run by neuroscience nurses and other health professionals, covering all brain and spine conditions, from fairly common to the very rare.

Epilepsy Scotland, 0808 800 2200: A confidential freephone number for anyone looking for advice or information about epilepsy.

Dravet Syndrome Foundation, 07874 866 937: Dravet Syndrome UK is an independent UK charity dedicated to improving the lives of those affected by Dravet syndrome through support, education and medical research.