

**TESH: Telehealth Education for
School Health presents**

Seizure Disorders in Children

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October 5, 2011

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Disclaimers – slide 1 of 4**

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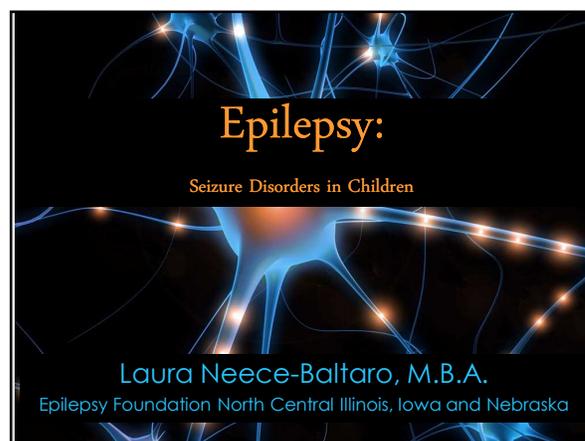
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- For more information about TESH, Telehealth Education for School Health, please contact: kathy.karsting@nebraska.gov.

THANK YOU!



What is Epilepsy

- ▣ Greek word: seized by forces from without
- ▣ A condition of **recurrent** and **unprovoked** seizures
 - 2 or more seizures without a clear cause (e.g. alcohol withdrawal or poisoning)
 - "Seizure Disorder" = Epilepsy

What is a Seizure?

- ▣ Excessive/disorderly discharge of nerve tissue
- ▣ Imbalance between **excitation** and **inhibition** of nerve cell activity
- ▣ Seizures can be many things – depending on
 - **where** in the brain and
 - **how much** of the brain is affected

Seizures can manifest as:

- Motor event
- Sensory hallucinations
 - smell, sight, sound, touch, taste
- Autonomic symptoms
 - sweating, incontinence, drop in blood pressure, sluggish pupil reaction, change in heart rate, funny feeling in stomach
- Psychic symptoms
 - Intense emotions (fear, panic, impending doom)
 - Language or perceptual distortions

Eileen "Peggy" Vining, MD

Johns Hopkins University:



"**Anything** your brain can do normally, it can do abnormally as a seizure."

Did you know that:

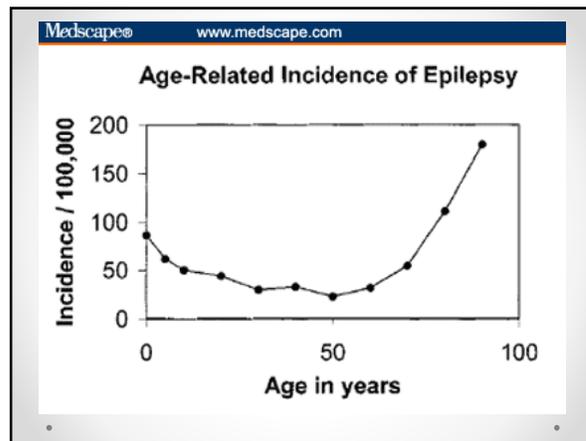
- ▣ Epilepsy is not contagious
- ▣ The tongue **cannot** be swallowed during a seizure
- ▣ Most seizures are **not** medical emergencies
- ▣ Epilepsy is not a form of mental illness
- ▣ Epilepsy can begin at any age from birth to 99+
- ▣ Epilepsy can & does affect memory and learning.
- ▣ **NOTHING** should be put **in the mouth** of a person having a seizure
- ▣ Medication does not stop all seizures .

Epilepsy is common!

Epilepsy is more common than Parkinson's disease, muscular dystrophy, cerebral palsy, and multiple sclerosis combined.

Incidence of Epilepsy

- **0.5-1.0%** will have epilepsy in their lifetime (EFA estimate)
- Up to **12 million people in US** (Columbia University, Dec 2010)
- Highest incidence at extremes of age
 - 0-2 years
 - Rises dramatically after age 65
 - 4 x as common in 80's as in 40's

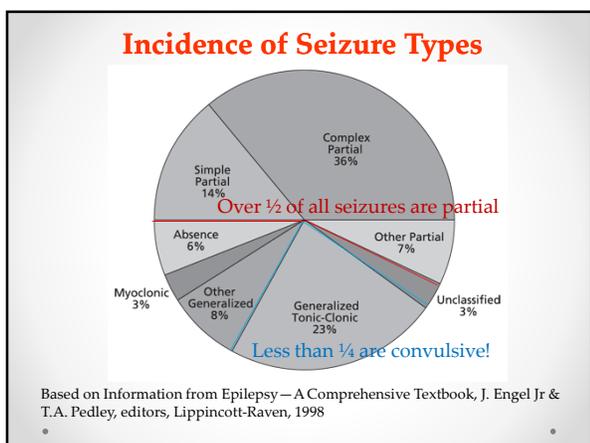


Causes

- **Trauma / head injury**
- **Brain lesions (e.g. tumors, tuberous sclerosis)**
- **Malformations / CNS abnormalities**
- **CNS infections (e.g. meningitis, encephalitis)**
- **Stroke**
- **Poisoning, including Illicit Drug Use**
- **Neurodegenerative Disease**
 - Alzheimer's – 5% develop epilepsy
- **Systemic Diseases increase the risk**
 - Hypertension, diabetes, celiac disease, lupus
- **Genetics**

Classification of Seizures

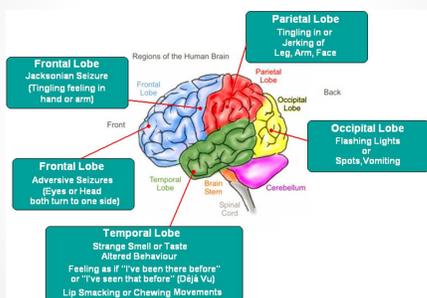
Partial seizures	Generalized Seizures
<ul style="list-style-type: none"> • Simple Partial <ul style="list-style-type: none"> ◦ Awareness not impaired • Complex Partial <ul style="list-style-type: none"> ◦ Awareness impaired/lost • Partial Seizures secondarily generalizing 	<ul style="list-style-type: none"> • Absence <ul style="list-style-type: none"> ◦ Typical ◦ Atypical • Myoclonic • Clonic • Tonic • Tonic-Clonic • Atonic



Status Epilepticus: A Neurological Emergency

- A prolonged seizure state lasting 30 minutes or more
- More than 3 seizures occurring within 1 hour
- Patient seizes continuously or has seizure after seizure without stopping
- Life threatening—Seek immediate emergency care

More on: Partial Seizures



- ## Partial Seizures
- Motor
 - Sensory/ Perceptual
 - Autonomic
 - Psychic

Partial MOTOR Seizures

- **Abnormal Movements**
 - Specific muscles
 - Groups of muscles
- **Rhythmic muscle contractions**
- **Head movements**
- **Forced turning of the head**

Partial SENSORY Seizures

- **Auditory**
 - hallucinations: buzzing, ringing, music, speech
- **Visual**
 - Blurring, blindness, hallucinations
- **Touch**
 - Tingling, numbness, burning sensations
 - Sensation of a light touch to the skin
- **Olfactory**
 - Intense unpleasant smells
- **Taste**

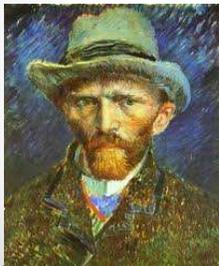
Partial AUTONOMIC Seizures

- Heart rate / Blood pressure
- Skin temperature / color
- Sweating / flushing
- Pupil dilation
- Digestive tract movement / noises
- Vomiting
- Respiratory inhibition
- Piloerection = Goose bumps

Partial PSYCHIC Seizures

- Fear
- Dread / Foreboding
- Anger
- Déjà vu / Jamais vu
- Language: dysphasia
- Memory: dysmnesic
- Gelastic seizures (Laughter)

Vincent Van Gogh: Partial Visual Seizures and Partial Psychic Seizures




Lewis Carroll:

Alice in
Wonderland

Visual & Spatial
Partial Seizures



Seizure First Aid

- Most seizures are **not** medical emergencies
- Basic first aid includes many common elements but varies depending whether there is:
 - **No change in consciousness** (Simple Partial Seizure)
 - **Altered Awareness** (Complex Partial Seizure)
 - **Loss of Consciousness** (Generalized Tonic-Clonic)

First Aid: No Change in Consciousness—Simple Partial

- **Stay calm**
- **Reassure the student that he or she is safe**
- **Time the seizure**
- **Explain to others, if necessary**
- **Protect student's privacy**

First Aid: Altered Awareness— Complex Partial

1. Time the seizure
2. Speak softly & calmly
3. Don't grab or hold
4. Protect from hazards
5. Allow for wandering in contained area
6. Be prepared in case the seizure generalizes (becomes convulsive)
7. Be prepared for emergency protocol if seizure lasts >5 minutes or beyond what is usual for that student.






First Aid: Tonic-Clonic

1. **Protect from potentially harmful objects.**
2. **Cushion head.**
3. **Turn on side and keep airway clear**
4. **Observe & time events**
5. **NOTHING in the mouth**
6. **Don't hold down.**
7. **Follow student's seizure action plan.**















Seizure in a Wheelchair

- Do not remove from chair unless absolutely necessary
- Secure wheelchair
- Fasten seatbelt loosely to prevent falling from chair.
- Protect & support head
- Keep airway open and allow secretions to flow from mouth
- Pad wheelchair to prevent further injury
- Follow student's seizure first aid plan.

What makes a seizure an EMERGENCY?

- First time seizure
- Convulsive seizure lasting more than 5 minutes
- Repeated seizures without regaining awareness
- More seizures than usual, or change in type
- Student has diabetes or is pregnant
- Seizure occurs in water
- Student is injured
- Parents request emergency evaluation

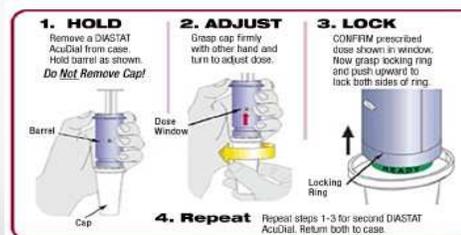
Rescue Medication: DIASTAT ACUDIAL



Diastat (rectal diazepam gel – the only FDA approved product for non-medical professional administration)

Pharmacist sets & locks correct dosage when dispensed.

Caregiver confirms correct dosage is visible in window on barrel.



Diastat: Preparing

- Lay person **on their side** in safe place.
- **Remove cap** from plunger tip by pushing up with thumb and pulling cap from syringe.
- Be sure the **plastic sealing pin** is attached inside the cap and has been removed from barrel.
- Open packet of **lubricating jelly** and stick tip of syringe in – making sure it is well lubricated.
- With person facing you, **bend upper leg forward** toward you to expose rectum.

Diastat Administration 3 counts of 3!

- Gently insert tip into rectum.
- **SLOWLY count to 3** while gently **pushing plunger** in until it stops.
- **Leave syringe in** rectum while you **slowly count to 3** a second time.
- Remove syringe from rectum and **hold buttocks together** for another **slow count of 3** – to prevent rectal leakage.
- Note time given, keep person on side and continue to observe.

Diastat: Eventualities

- **Sleepiness** – student may need to sleep it off.
- **Diarrhea** – hold buttocks closed to avoid diarrhea – but be prepared. Student should be on side, facing you.
- **Respiratory inhibition** – only 1% (or less) of patients.

Seizure 1st Aid: VNS Magnet

One swipe over device (usually left chest just below collarbone).



<http://us.cyberonics.com/en/vns-therapy-for-epilepsy/patients-and-families>

Seizure Preparedness at School

- Forms available from Epilepsy Foundation
 - **Seizure Action Plan**
 - **Parent Questionnaire for a Student with Epilepsy**
 - **Seizure Observation Record**
- www.epilepsyfoundation.org/livingwiththeepilepsy/educators/socialissues/schoolnurseprogram/index.cfm

Preparing: The Seizure Action Plan

- **Assess student needs / gather information**
 - Parent questionnaire
 - From teachers & school staff
 - Seizure triggers
 - Impact on learning & behavior
- **Customize a Seizure Action Plan**
- **Teach school personnel and tailor interventions as needed**
- **Update annually, more often if needed!**

The Seizure Action Plan

- Completed by the school nurse
- Provides basic information about student's seizures, seizure first aid and emergency response plan for that student
- Distribute to relevant school personnel
 - At beginning of school year,
 - When a diagnosis is made
 - When a change in health status occurs
- Signed and approved by the treating physician (generally)

Suggestions for School Nurses

- **LOG** for communicating daily or weekly with parents/guardians
- **LIAISON** between parents and teachers regarding any changes in status or health
- **COACH** teachers to regularly note physical, emotional or cognitive changes
- **CREATE** a "substitute teacher" folder which includes
 - Seizure Action Plan
 - Seizure first aid and other relevant information

Train Other School Staff

- What is a seizure? What is epilepsy?
- Who has epilepsy?
- What do seizures look like?
- What are common myths about epilepsy?
- What is appropriate first aid for seizures?
- When is a seizure an emergency?
- What causes seizures?

More School Staff Training Topics

- What are common seizure triggers?
- What can be done to prevent stigma and promote a more inclusive school community?
- What is a Seizure Action Plan? How is it used?
- What is a Seizure Observation Form? How is it used?

Optional Topics (as appropriate)

- Seizures outside the classroom (field trips, playground, etc.)
- Seizures in a wheelchair
- Seizures on a school bus
- Seizures in water
- Special treatment issues:
 - Ketogenic diet
 - Vagus Nerve Stimulator (and magnet)
 - Use of rescue medication, rectal diazepam

Seizure Observation Record

- Complete when reporting all seizure events at school/school events.
- Helps to identify
 - seizure triggers
 - patterns
 - precautions.

DIAGNOSING EPILEPSY

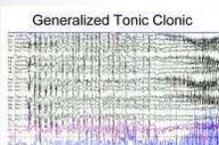


Diagnostic Tools for Epilepsy

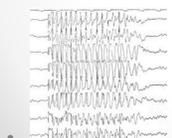
- Observation
- EEG
 - Outpatient
 - Inpatient
 - Ambulatory
- MRI
- MEG



EEG=Electroencephalography



Absence Seizure ↓



Temporal Lobe Epilepsy ↑



What the EEG is and is NOT

• It is:

- A **snapshot** of the brain activity at the time of the EEG
- **Surface electrodes** trying to measure deep brain electrical activity

• It is NOT

- a **definitive diagnosis**
 - Normal EEG only means that there was no abnormal activity during the EEG
 - Abnormal activity doesn't always mean epilepsy

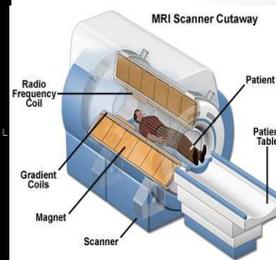
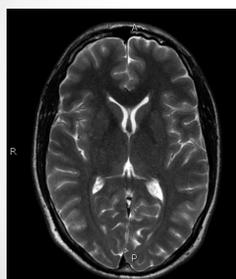
Overcoming EEG's drawbacks

- **24-hour video EEG** monitoring matches brain wave activity to behaviors / motor events



- **Intracranial EEG grids** detect deeper seizure activity -- **INVASIVE**

MRI



Why an MRI?

- **To rule out treatable conditions:**
 - tumors,
 - venous malformations,
 - aneurysms, etc.
- **To determine the location and extent of any abnormal or scarred brain tissue.**
 - Should epilepsy surgery be considered?

What if the MRI is normal?

- **A normal MRI does not rule out epilepsy**
- **Epilepsy patients with normal MRIs generally have better outcomes**
 - Their epilepsy responds better to medication
 - Monotherapy:
 - They can often be treated with one drug
 - Less side effects!
 - In children, there is a higher likelihood that they will outgrow the epilepsy.

MEG

- Seizures produce magnet fields measurable by MEG
- Identifies the focus of seizure onset
- Non-invasive
- Used to make surgical decisions
 - Will surgery help without causing too much damage
 - Where & how much to take out



Differential diagnoses

- Syncope
- Behavior disorders / Sleep disorders
- ADHD
- Oppositional Defiant Disorder
- Migraines
- Tourette's
- Movement disorders
- Panic Attacks
- Psychogenic Non-Epileptic Attacks (PNEA's)

Concomitant Disorders

- **Intellectual Disability**
 - Approximately 30% will also have epilepsy
- **ADHD**
 - Children with ADHD 2 to 5 times as likely to have epilepsy
- **Autism**
 - 27-65% have EEG abnormalities.
 - Up to 35% may develop some form of epilepsy
- **Cerebral Palsy**
 - 20-30 % will also have epilepsy

Treatment of Epilepsy

- Lifestyle changes
- Medication – AED's
- Surgery
- Diet
 - Ketogenic
 - Modified Atkins
- VNS = Vagus Nerve Stimulator

Lifestyle changes

- Dietary:
 - Avoid caffeine
 - Avoid insulin spikes (eat a low glycemic diet)
 - No alcohol
- Maintain a Regular Schedule
- Sleep – Get enough of it!
- Stress
 - Avoid it
 - Use relaxation techniques
- Avoid Seizure Triggers
 - Flashing lights in only 1 to 3% of people with epilepsy

Medication: The First Line of Therapy

- Monotherapy controls 50-60%
- Polytherapy: additional 15-20% controlled
- Side effects! All epilepsy drugs have potential side effects, some serious.
- To minimize adverse side effects, many neurologists will try 3-4 monotherapy medications before resorting to polytherapy

New Medications!

- There are now 28 medications available for epilepsy.
- Since 1993 the available medications for epilepsy have more than tripled.
- Some of newer medications are
 - better tolerated
 - less onerous side effects
 - Better efficacy in some patients

Sources: www.epilepsyfoundation.org; www.drugs.com;

APPROVAL	GENERIC NAME	BRAND NAME	Distributor/NOTES
1857	potassium bromide		Lots of bad side effects
1882	paraldehyde		Potential for abuse / addictive
1912	phenobarbital	Luminal	NOT useful in ABSENCE, potential for abuse
1935	mephobarbital	Mebarel	Potential for abuse – can suppress respiration – off market 2011
1938	phenytoin (previously: diphenylhydantoin)	Dilantin	Parke-Davis – now Pfizer NOT useful in ABSENCE
1945	trimethadione	Tridione	1 st drug available for ABSENCE seizures
1958	ethosuximide	Zarontin	Originally Parke-Davis – now generic / for ABSENCE
1968	carbamazepine	Tegretol	Ciba-Geigy – now Novartis (mental slowing, drowsiness)
1972-1979	Benzodiazepines • Clonazepam (1972) • Clonazepam (1974) • Lorazepam (1977)	Valium Tranxene Klonopin Ativan	Roche: *dependency and tolerance build with continued use – therefore used mainly as "Rescue" meds, i.e. for Status epilepticus. Can suppress respiration.
*****	10-YEAR GAP**		
1978	valproic Acid	Depakene/Depakote	
*****	10-YEAR GAP**		
1993	felbamate	Felbatol	MedPointe / Blackbox warning: Aplastic Anemia & Liver Failure!
1994	gabapentine	Neurontin	Parke-Davis–now Pfizer (less effective than other AEDs)
1994	lamotrigine	Lamictal	Glaxo-SmithKline (widely effective in many sz types)
1996	topiramate	Topamax	Ortho-McNeil
1997	tiagabine	Gabitril	Cephalon
1997	diazepam – rectal gel	Diastat	Acetl: "Rescue" medication – Status epilepticus
1997	carbamazepine – x release	Carbatrol	Shire: Sustained release formulation of carbamazepine
2000	oxcarbazepine	Trileptal	Novartis (related to carbamazepine – less side effects)
2000	zonisamide	Zonegran	Esai
2005	pregabalin	Lyrica	Pfizer
2008	levetiracetam	Keppra	UCB (widely effective in many sz types)
2008	rufinamide	Banzel	Esai: for Lennox-Gastaut
2010	lacosamide	Vimpat	UCB: partial onset seizures
2009	vigabatrin	Sabri	Lundbeck: for Lennox-Gastaut (Vision Loss!)
2011	ezogabine (aka: retigabine)	Potiga	Glaxo Smith Kline / Valeant (known in Europe: Trobalt)

The “Down” Side of Medication

- Fatigue, Dizziness, Blurred Vision
- Cognitive side effects
 - Slowing / depression
 - Forgetfulness
 - Short term memory problems
 - Word recall problems
- Teratogenicity
- Osteoporosis
- Interference with effectiveness of birth control pills
- some antibiotics decrease effectiveness

Dangerous Side Effects

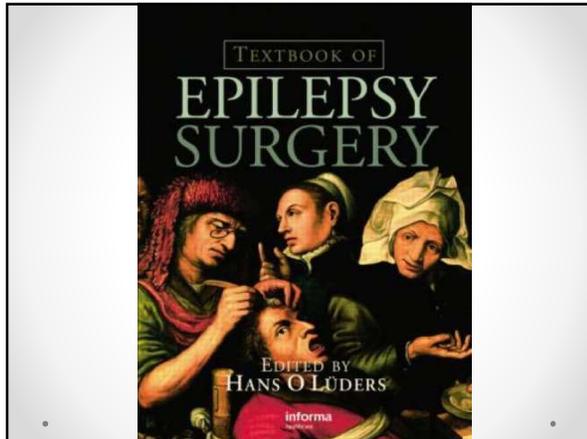
- **RASH!** – Stevens-Johnson Syndrome
 - Any epilepsy patient with a rash should consult their neurologist immediately
- **Liver** inflammation / failure
- **Blood**
 - Aplastic Anemia
 - Seriously low white blood cell counts
 - Seriously low platelet counts

Mild Stevens-Johnson Rash



Other Possible Side Effects

- **Sleep** disorders
 - Difficulty falling asleep / staying asleep
 - Sleeping all the time
- Changes in **appetite**
- **Aggression**
- **Hyperactivity**
- Brittle **hair** – loss of hair
- **Dental** – gum hyperplasia



Types of Surgery

- **Resection**
 - Most common epilepsy surgery
 - Removal of the area causing the seizures
- **Disconnection**
 - Corpus callosotomy
 - Multiple subpial transections
 - Relief, not a cure
 - Used for areas of the brain that cannot be removed
 - Still being developed, limited application at this time
- **Hemispherectomy**

Preparing for Surgery

- **Thorough history** and complete classification of patient's seizure type(s)
- **Long-term video EEG** monitoring
- **Imaging**
 - MRI
 - MEG
 - Possibly: CAT, PET, SPECT
- **Neuropsychological Testing**
 - WADA Test assesses memory and language location

Surgical Outcomes

- **Factors predicting success**
 - Seizures coming from one localized focus
 - Normal MRI
 - Normal EEG
 - Surgery at major epilepsy surgery center
- **Outcome / Prognosis**
 - At some surgical centers as many as 60-80 % of patients are seizure free after surgery
 - Most patients get some relief of their seizures
 - Less frequent
 - Less severe

Dietary Solutions

- **Ketogenic Diet**
- **MCT modified Ketogenic Diet**
(Medium Chain Triglycerides)
- **Modified Atkins**
- **Low Glycemic Diet**

Ketogenic Diet

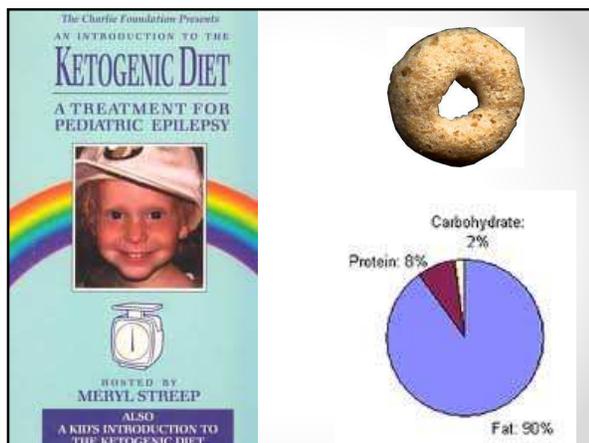
- **Long history**
 - Biblical reference
 - Greeks: fasting and eating "short rations" could cure seizures
- **Very popular in 1920's and 1930's**
 - No good epilepsy medications, only bromides which make people sleepy and stupid
- **Resurgence in 1990's**
 - Hollywood Director Jim Abrahamson to treat son, Charlie
 - Johns-Hopkins University and Dr. John Freeman

Ketogenic Diet: Difficulties

- High ratio of fat in meals (**90% calories from fat**)
 - unpalatable and boring (use of MCT liquid can help)
- Calories consumed **LESS THAN daily requirement** (75-90%)!
- Measure and weigh all intake very carefully
 - Well-educated parents
 - A very precise (expensive) scale
 - Strong commitment to the process
- Easy to make a mistake
- Menu/servings must be recalculated as calorie requirements change

Ketogenic Diet: Difficulties (cont.)

- Foods and anything with carbohydrates in it needs to be locked up
- Unexpected Carbohydrates – BEWARE!
 - Certain **SUNSCREENS**
 - Some **sugarless gums**
 - Certain **TOOTHPASTES**

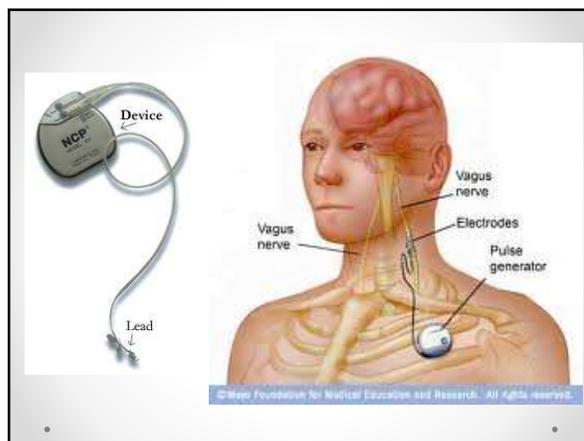


Modified Atkins and Low Glycemic Diets

- Introduced because the straight ketogenic diet is so difficult to follow
- Recent additions to treatment options
- Efficacy being researched now.

VNS: Vagus Nerve Stimulator

- FDA approved 1997
- Reduces the frequency and severity of seizures in many patients
- Efficacy can increase over time
- Often alleviates depression
 - Many epilepsy patients have depression
- Dosages of medications can sometimes be reduced (which in turn reduces side effects)
- Not a cure





VNS: Difficulties

- Side Effects
 - Coughing
 - Hoarseness or voice changes
 - Shortness of breath
 - Throat pain
 - Sleep apnea
- Must be programmed and reprogrammed
- Battery must be changed surgically
- Leads on vagus nerve difficult to remove

Seizure Assistance Dogs

- **Some** of them alert to an oncoming seizure
- Other ways they can help:
 - Retrieve a phone prior or post seizure
 - Push their person into a safe position
 - Pull away dangerous objects
 - Block individuals with partial or absence seizures from wandering into danger
 - Summon help in a controlled environment

Seizure Assistance Dogs Improve Quality of Life

- **Improve the quality of life of a person with epilepsy by:**
 - Staying with their person during a seizure
 - Instilling confidence
 - Providing companionship and
 - Contributing to overall emotional well-being

Seizure Assistance Dogs Web Sites

- <http://www.canineassistants.org/>
- <http://www.epilepsyfoundation.org/livingwithhepilepsy/healthandwellness/Seizure-Dogs.cfm>
- <http://www.ucb.com/patients/programmes/canine-assistants>

