Generalized Epilepsy

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DISCLOSURES

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Learning Objectives

- At the end of the session participants will be able to:
  - Describe the classification of generalized seizures
  - Discuss the semiology of generalized seizures
  - Distinguish clinical generalized seizure types

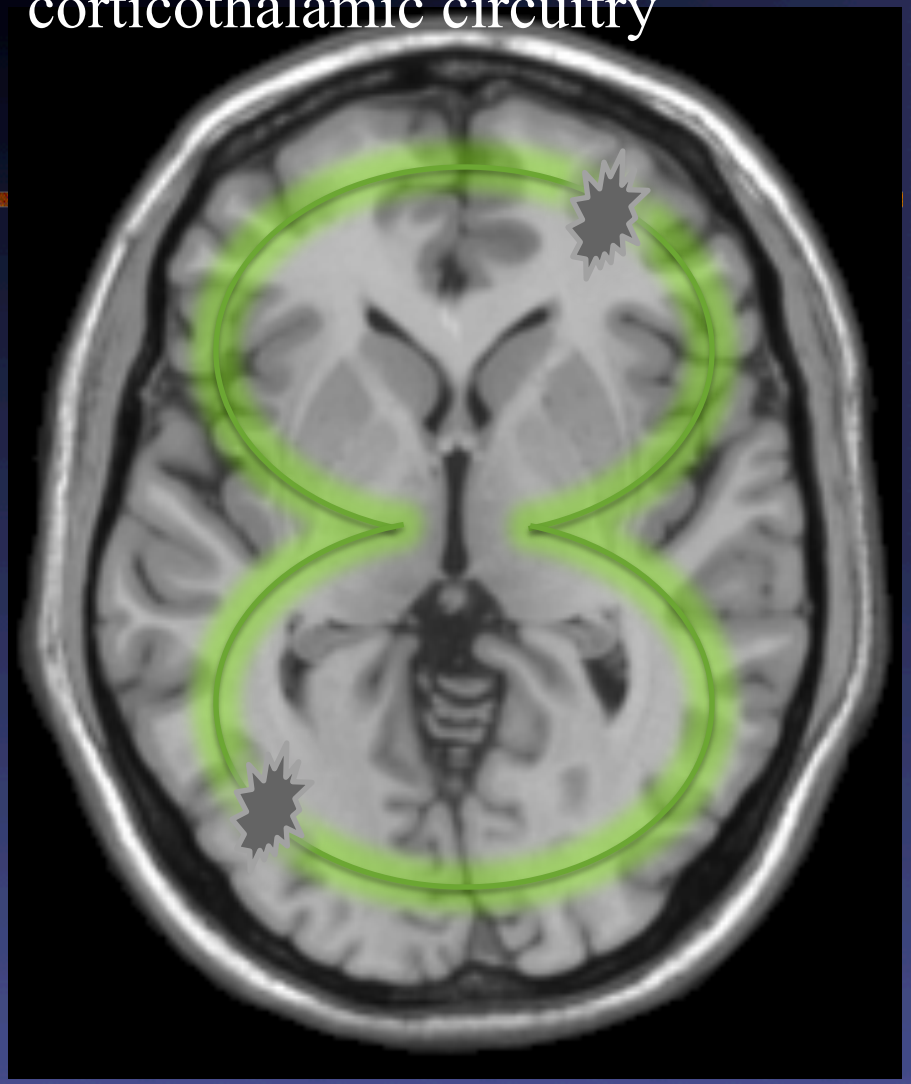
KEY MESSAGE

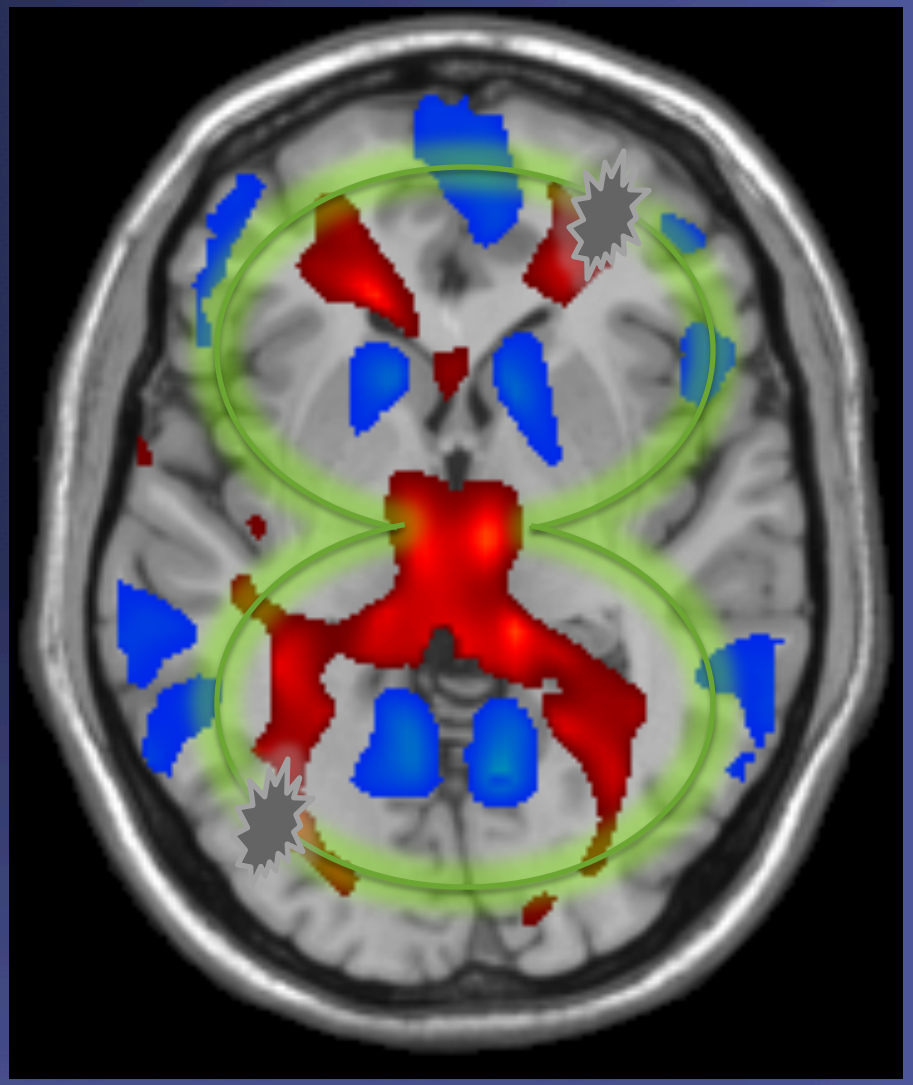
Clinical features distinguish the main types of generalized seizures

Generalized - reconceptualized

- For seizures
  - *Generalized epileptic seizures are conceptualized as originating at some point within, and rapidly engaging, bilaterally distributed networks. …can include cortical and subcortical structures, but not necessarily include the entire cortex.*

conceptual network for generalized seizures involving corticothalamic circuitry





a generalized seizure could start at different points and engage bilaterally distributed networks.

Generalized Seizures

Seizure types thought to occur within and result from rapid engagement of bilaterally distributed systems

- Tonic-clonic (in any combination)
- Epileptic spasms
- Absence
  - Typical
  - Atypical
  - With special features
    - Myoclonic
      - Eyelid myoclonia
- Myoclonic
  - Atonic
  - Tonic
- Clonic
- Tonic
- Atonic

Berg et al 2010

Some Generalized Epilepsy *Syndromes*

- Neonatal
  - Early myoclonic encephalopathy
  - Otohara's Syndrome
- Infancy
  - West Syndrome
  - Myoclonic encephalopathy in infancy
  - Dravet's Syndrome
- Childhood
  - Febrile seizures +
  - Epilepsy with myoclonic-atonic (astatic) seizures
  - Lennox-Gastaut Syndrome
  - Childhood absence epilepsy
- Adolescence-Adult
  - Juvenile absence epilepsy
  - Juvenile myoclonic epilepsy
  - Epilepsy with generalized tonic-clonic seizures alone
  - Progressive myoclonus epilepsies

Focal Seizures Evolving to Bilateral, Convulsive Seizures

- Previous terms:
  - partial seizure secondarily generalized
  - secondarily generalized tonic-clonic seizure
- With tonic, clonic or tonic and clonic components
- Mean duration 62 seconds (16-108)
- Mean preceding focal seizure duration 35 seconds (7-258)

Theodore et al 1994, Blume et al 2001

Generalized Tonic-clonic Seizures Tonic phase-1

- Lasts 10-20 seconds
- Flexion (brief)
  - Muscle contraction
  - Eyelids open, eyes up
  - Arms elevated, abducted, externally rotated, elbows semiflexed
  - Legs less involved, may be flexed

Generalized Tonic-clonic Seizures Tonic phase-2

- Extension
  - Back and neck
  - Tonic cry (2-12 seconds)
  - Arms extended
  - Legs extended, adducted, externally rotated

Generalized Tonic-clonic Seizures Tonic phase-3

- Tremor
  - 8 per second decreasing to 4 per second
  - From recurrent decreases in muscle tone
  - Leads to clonic phase

Generalized Tonic-Clonic Seizure

- Clonic Phase
  - Lasts about 30 seconds
  - Muscle relaxations interrupt tonic contraction
  - Brief, violent, flexor spasms of the whole body
  - Progressively longer relaxation periods
  - Tongue often bitten
  - Post-ictal unresponsiveness-confusion
  - Headache, Fatigue

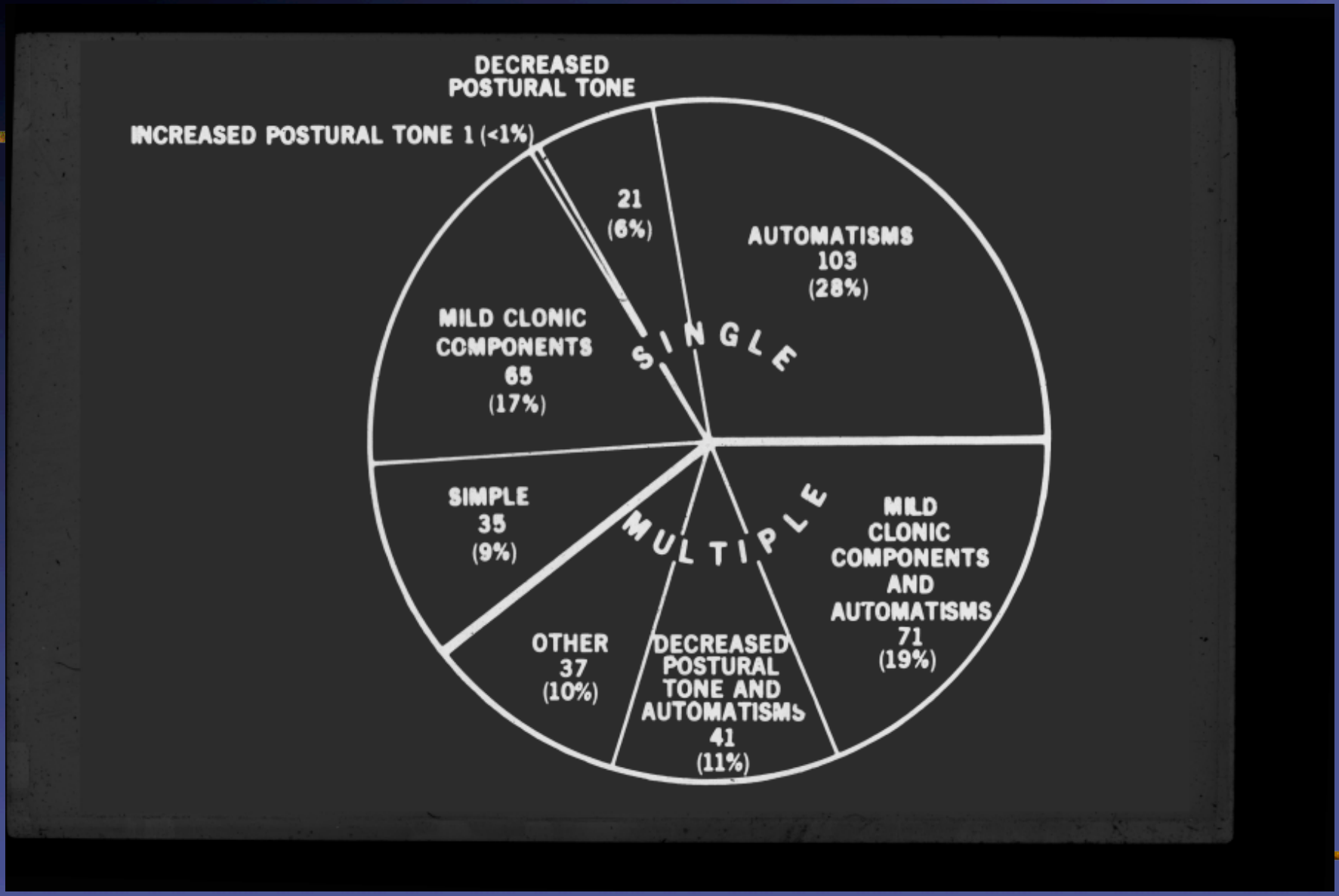
Generalized Tonic-Clonic Seizure

- Autonomic changes
  - Increased (up to 2 x) HR, BP
  - Increased (up to 6 x) bladder pressure
  - Pupillary mydriasis
  - Skin cyanotic
  - Glandular hypersecretion
  - Apnea

Absence Seizures

- Complete interruption of awareness
  - May fluctuate in long seizure cluster
- Abrupt onset and conclusion
- No warning, postictal confusion
- Most last less than 10 seconds
- Clonic jerks may occur
- May cluster

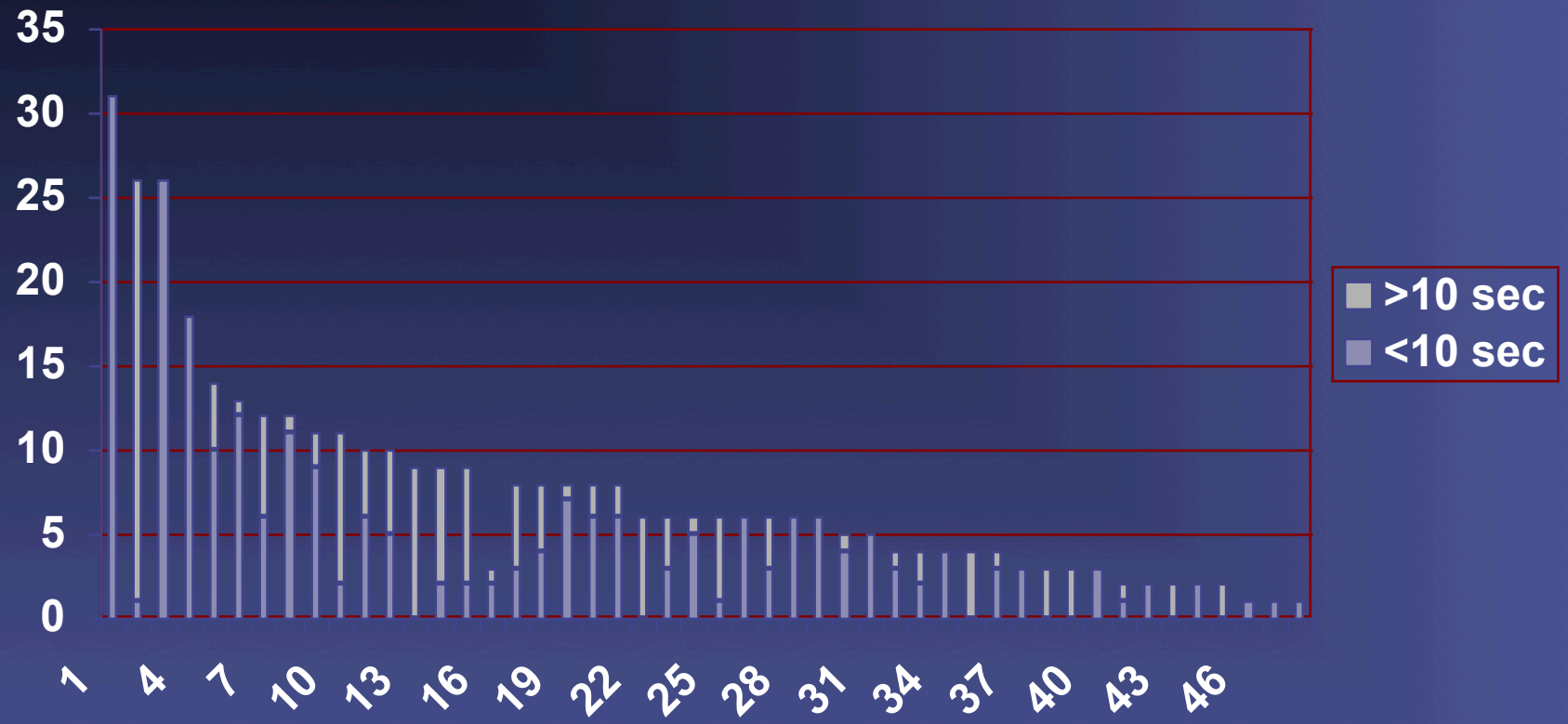
Clinical Features in Absence



Penry et al 1975

Absence Seizure Duration

most seizures less than 10 seconds



Juvenile Myoclonic Epilepsy

- Usually begins around puberty
- bilateral, single or repetitive, arrhythmic, irregular myoclonic jerks, predominantly in arms.
  - Common on awakening
- Some patients may fall suddenly
- No disturbance of consciousness
- GTCS 80-90%; absence less common

Wolf et al 2015

Focal Features in Generalized Epilepsy

Table 2 Summary of focal seizure symptoms reported by patients

Symptom type	Descriptions by patients	With GTCS	With MS/AS	Total
Motor				
Focal tonic/clonic/myoclonic	Stiffening, jerks, twitch, sudden shakes, sharp movements	10 (7.8)	5 (5.7)	10 (7.4)
Automatisms	Lip smacking, twirling fingers, chewing, flicking clothes, rearranging things, walking around in circles	5 (3.9)	6 (6.8)	11 (8.1)
Focal weakness		5 (3.9)	0	5 (3.7)
Eye version	Eyes roll to one side	1 (0.8)	0	1 (0.7)
Sensory				
Somatosensory	Numbness, tingling	2 (3.1)	7 (7.9)	9 (6.7)
Auditory	Ringing, echoing, noises getting louder	7 (5.5)	4 (4.5)	11 (8.1)
Olfactory	Bad smell	1 (0.8)	0	1 (0.7)
Gustatory	Metallic taste, bitter taste	2 (1.6)	1 (1.1)	2 (1.5)
Vision	Black and white spots, colorful spots, wiggly lines, see only half	18 (14.1)	8 (9.1)	24 (17.8)
Cephalic	Funny feeling in head, hard to describe	3 (2.3)	0	3 (2.2)
Autonomic				
Visceral/epigastric	Rising sensation, butterflies, rush, electric surge, tingling, queasy, sick, tingling in stomach	14 (10.9)	3 (3.4)	16 (11.9)
Chest tightness	Tightness in chest with panic sensation	2 (1.6)	1 (1.1)	3 (2.2)
Cardiac	Palpitations	2 (1.6)	1 (1.1)	3 (2.2)
Diaphoresis/flushing/warmth	Sweaty feet, hot flush, feel warm	4 (3.1)	0	4 (3)
Psychic				
Déjà vu	Familiar feeling, being there before	4 (3.1)	0	4 (3)
Autoscopy	Feeling out of body, like watching yourself	1 (0.8)	0	1 (0.7)
Euphoria	Overwhelming happiness	1 (0.8)	0	1 (0.7)
Speech				
Aphasia	Wanted to talk but could not, slower processing of speech, slurred speech, difficulty in understanding, could not speak the right word	20 (15.6)	19 (21.5)	33 (24.4)

Abbreviations: AS = absence seizures; GTCS = generalized tonic-clonic seizures; MS = myoclonic seizures.
Data are presented as n (%).

Senevirate et al 2015

Atonic Seizures

- Diffuse loss of tone
- Loss of awareness
- Abrupt onset and conclusion
- Last 10-20 seconds
- Slow spike-wave on EEG

Lennox-Gastaut Syndrome

- Etiology
  - Unknown in 30-70%
  - Metabolic encephalopathy
  - Phakomatoses
  - Infections
  - Perinatal compromise
- Prognosis
  - Related to underlying cause
  - ↓ if history of infantile spasms
  - ↓ Developmental delay at seizure onset

Lennox-Gastaut Syndrome

- Static encephalopathy
  - Cognitive function ~ drugs, seizure control
- EEG
  - Abnormal background
  - ‘slow spike waves’
  - May have nearly continuous discharges
  - May not fully parallel clinical events
- Onset earlier than primary generalized absence
  - <2 yrs: head drop, eye blinking, laugh, flush

Lennox-Gastaut Syndrome Seizure types

- Atonic
  - Tone changes greater than in absence
  - Usually loss of consciousness
  - Onset / cessation less abrupt
- Prolonged absence with clonic components
- ‘astatic-myoclonic:’ jerk before fall
- GTC, tonic, clonic in 60%
  - May be initial episode in older children

Data Needed for Classification

- History
  - Family history
- Physical exam
- Metabolic and genetic studies
- Description of ictal semiology
  - Possibly video
- EEG
  - Possibly long-term monitoring
- Neuroimaging

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