



**FERNE / MEMC IV Neurological Emergencies Track:
Seizure Recognition and Management in the ED
Jamal R. Saadah, MD, FACEP**

**Seizure Recognition and Management
in the ED**

JAMAL R. SAADAH, MD, FACEP
American Hospital Dubai
Chairman, Department of Emergency Medicine
Director, Emergency Medical Services
DEM
Dubai
United Arab Emirates
E-mail: drjindubai@yahoo.com


 Acute Neurologic Emergencies MEMCIV Sorrento, Italy
Sept 15-17 2007

Our Panelists:

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Edward P. Sloan, MD, FACEP, MPH

Professor
Department of Emergency Medicine
University of Illinois at Chicago

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Andy Jagoda, MD, FACEP

Professor and Vice Chair
Department of Emergency Medicine
Mount Sinai School of Medicine


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**Niranjan 'Tex' Kissoon, FRCP(C),
FAAP, FCCM, FACEP**

Senior Medical Director
Associate Head and Professor
British Columbia Children's Hospital
Vancouver, B.C., Canada

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Case Presentations


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Case One


A 64 y/o Man with a 2/52 h/o increasing irritability

- Chief Complaint: family noticed he was behaving “inappropriately”
- h/o the chief complaint:
 - Pt was found by his wife sitting in his car and piloting it as if it were an airplane

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Case one Cont'd

- On arrival to the hospital the pt was found:
 - Delusional- claiming that he was able to read minds and was in direct communication with God
 - The patient was subsequently diagnosed as having a 'psychotic disorder' and was placed on a psychiatric ward

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Case one cont'd...

- During his admission, the patient continued to exhibit bizarre behavior characterized by:
 - Intermittent agitation
 - Episodes of motor preservation with lucid intervals: such as: turning around in circles, tapping his arms, and moving both arms in a circular fashion
 - He was able to perform simple tasks even during periods when he was unable to speak

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Case one cont'd...

- Two days after his admission, he suffered from a generalized convulsion
 - EEG showed generalized 1.5- to 2-Hz of bisynchronous multiple spike-and-wave activity with maximal distribution in the frontal region
 - Under EEG monitoring, the patient was given 2 mg of diazepam with dramatic clinical improvement and rapid disappearance of epileptiform EEG activity

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Case one cont'd

- Two days later, however, the patient experienced a recurrence of clinical symptoms, which were accompanied by EEG changes characterized by intermittent episodes of diffuse, rhythmic, medium-amplitude (1.5-2 Hz) delta activity, which improved after phenytoin and phenobarbital were administered

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Case Two

- An 18 y/o woman with a h/o of seizures
 - Chief complaint: fluctuating level of consciousness
 - On arrival to the ED:
 - Patient exhibited brief periods of responsiveness to deep pain only ranging to a more trance-like state
 - Her speech was characterized by stereotyped phrases such as “stop it”
 - She was noticed to have purposeless movements and rare lip smacking
 - Her extremities could be passively positioned and maintained in an unusual position

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Case two cont'd...

- The patient was quickly diagnosed as having “catatonic schizophrenia”
- EEG showed continuous cyclical pattern of low-voltage rhythmical activity, high-voltage sharp waves and low-voltage slowing



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Case two cont'd...

- The patient was treated with antiepileptic drugs with improvement in the EEG pattern of the clinical status



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Case Three

- A 74 y/o woman who was seen in the ED for a chief complaint of cognitive changes
- Symptoms were characterized by forgetfulness
- Bizarre behavior:
 - Left the house w/o a key
 - Got on a bus with no money
 - And verbally perseverated on her mobile



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Case three cont'd..

- While in the ED, the patient was:
 - Confused
 - Agitated
 - Perseverating: repeating her address continually in response to any question
 - Had catalepsy: waxy limb rigidity
 - Subtle face
 - And limb myoclonous



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Case three cont'd...

- EEG showed seizure activity arising from the frontal region, quickly generalizing and persisting over both frontotemporal regions
- The EEG abnormalities normalized with the administration of 3 mg of lorazepam
- The patient remained confused until she fell asleep, but awoke the next morning alert refreshed and oriented with no recollection of the prior day's events



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Analyses of Cases



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What are the prominent clinical features in each of our cases?

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Case 1
Clinical features:
• had psychotic features and bizarre behavior

Case 2
Clinical features:
• had AMS and catalepsy with mild automatisms

Case 3
Clinical features:
• had a combination of different clinical presentations

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• Each of the cases described presented with a constellation of symptoms that should alert the clinician of the potential for **Nonconvulsive Status Epilepticus (NCSE)**

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Clinical Characteristics

- Manifestations vary considerably
- They range from subtle changes recognizable only to family members all the way through to delirium or coma
- The variety of presentations described in the literature include:
 - Mild cognitive changes
 - Prolonged AMS and confusional states
 - Mood and speech disturbances
 - Echolalia
 - Confabulation
 - Uncharacteristic bizarre behavior
 - Clear psychotic states
 - Autonomic disturbances (belching, borborygmus, flatulence)
 - Sensory and psychotic phenomena
- NCSE is no doubt a challenging diagnosis especially in patients with cognitive impairment at baseline (dementia, MR)

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What would your diagnostic approach be?

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Diagnostic Approach


- The differential diagnosis of AMS is extensive
- Because of its wide range of presentations, the diagnosis of NCSE is often missed
- In order to place a patient's presentation into the proper context the following are essential:
 - Detailed history
 - A change from baseline status
 - Onset and duration
 - The presence or absence of lucid intervals
 - Timing in relation to the sleep/wake cycle
 - Presence or absence of motor activity or automatisms
 - Past medical, neurologic and psychiatric history
 - Past family history and social history
 - Medication history

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Diagnostic approach cont'd...

- *What is the importance of EEG?*
 - There are no clear guidelines to guide the decision when an EEG should be requested
 - An EEG is indicated to confirm the diagnosis of NCSE when clinically suspected


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Diagnostic approach cont'd...

- There are 2 types of NCSE:
 - **Absence seizures (AS):**
 - EEG shows continuous generalized, rhythmic, bilaterally synchronous, spike and wave discharges at 3 second intervals with a maximum over the bifrontal region
 - **Complex Partial Status (CPS):**
 - Less synchronous seizure activity
 - Rhythmical slowing and rhythmic spikes as well as rhythmic sharp and slow waves
- Despite these characteristic EEG changes, there is no path gnomonic pattern identified for either one


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How would you best treat each of these patients with NCSE?

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Treatment

- **General Principles:**
 - Include early identification of the causative and precipitating factors
 - Identification of physiologic stressors including infections, toxins, metabolic abnormalities, structural lesions, drug interactions or withdrawal and pregnancy should be sought in all patients presenting with either a new seizure or exacerbation of a known disorder

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Treatment cont'd...

- **Benzodiazepines:**
 - Such as diazepam, lorazepam and clonazepam have been used as monotherapy
 - Act primarily as diagnostic agents. They are therapeutic, but due to their short duration of action, they are not recommended as monotherapy in the treatment of NCSE
 - The use of long-acting antiepileptic drugs is recommended to achieve lasting effects

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Treatment cont'd...

- **Other agents:**
 - Since the effect of benzodiazepines is transient, several other options are available:
 - Carbamazepine
 - Phenytoin
 - Phenobarbital
 - Pirimidone
 - Valproic acid
 - Ethosuximide

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What are some prognostic indicators for patients with NCSE?



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PROGNOSIS


- Because of the lack of well-designed studies, there are no clear guidelines on the treatment of NCSE
- The true incidence is not well defined, nor are its morbidity and mortality
- Some have reported a high morbidity and mortality and have suggested aggressive therapy
- Others, have made the recommendation that NCSE is a benign condition
- In one study, mortality was as high as 27% in patients with NCSE who had an acute medical condition as the underlying cause
- In most elderly with NCSE, the mortality rate is higher because of the severity of the underlying cause and because of hospital acquired infections
- In summary, the data suggest that NCSE generally does not result in permanent cognitive or neurologic deficit unless it occurs in the setting of an underlying acute medical condition
- Because of the lack of well-designed studies, there are no clear guidelines on the treatment of NCSE, and a significant controversy still exists regarding the need for aggressive therapy



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In Summary


- NCSE is the ultimate condition in which the principles of neurology and psychiatry meet, and at times overlap
- NCSE, once thought to be a rare cause of AMS, has been described increasingly in the epilepsy literature
- NCSE is amongst the most frequently missed diagnoses in patients who have presented with AMS
- Like convulsive status, NCSE is a state of continuous or intermittent seizure activity without a return to baseline lasting more than 30 minutes
- The hallmark of NCSE is a change in behavior or mental status that is associated with diagnostic EEG changes
- **There are two main types of NCSE:**
 - **Absence status:** a primarily generalized process
 - **Complex partial status:** which is focal in origin



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Summary cont'd...


- No clear data on the true incidence of NCSE exist
- It is estimated that 1.5 in 100,000 patients are diagnosed with some form of NCSE
- NCSE has been reported in all age groups, both sexes without a clear predominance in either sex
- In 15-70% of all cases of NCSE, different precipitating factors are implicated owing to the importance of assessment in the evaluation of these patients



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References

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- Psychiatric clinics of NA- Volume 28, Issue 3 (September 2005)
- Differentiation of AS and CPS. Epilepsia (1971) 12: pp 77-78
- NCSE: clinical features, neuropsychological testing and long-term follow up. Neurology (1986) 36: pp 1284-1291



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Five minutes for Q's & A's to the panelists



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Epilepsy Case studies



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CASE 1: The First Seizure



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- Following a night of heavy Etoh consumption, a 19 y/o man went to bed at 04:00
- At 06:00 the man's roommate was awakened by a commotion
- The patient was found 'convulsing in bed'
 - He looked blue
 - Foamed at the mouth
 - And was breathing hard
- 911 was called...



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- The ambulance arrives to find the patient awake, but confused
- The patient was transported to a near-by ED
- In the ED, one hour later, the patient
 - Was AAOX3
 - Incontinent of urine
 - c/o achy muscles
- A CBC and full chemistry panels were normal
- A blood alcohol level was low but not zero
- A CT scan of his head was normal
- A neurologic evaluation was completely normal



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QUESTIONS



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Does the patient have epilepsy?!

- Epilepsy is defined as a tendency to seizures on a chronic or recurrent basis (i.e. at least two seizures must occur for a diagnosis of epilepsy)
- According to this criterion, our patient cannot be said to have epilepsy



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• Was the convulsion caused by a temporary event or condition?

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• This patient could have had:

- Convulsive syncope
- His recent alcohol binge could have lowered his seizure threshold
- He could have been dehydrated from all the alcohol
- He could have had an alcohol withdrawal seizure (but more commonly occurs 12 to 24 hrs following the last drink)
- Sleep deprivation

• Nevertheless, every person who has epilepsy must have had a first seizure at some point and the rest of the questions must be addressed

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What other tests should be done?

- Blood tests should be done looking for metabolic derangements
- A UDS should be done
- A CT scan of the brain
- If CT is negative and either SAH or meningitis is suspected, then an L.P. should be done
- An MRI and an EEG should be scheduled ASAP
- EEG is the gold standard for the diagnosis of epilepsy, but is only positive in 50% of the times
- A historical evaluation should be sought looking for "remote symptomatic neurologic events", such as:
 - Recent major head trauma
 - A recent h/o meningitis or encephalitis
 - And recent neurosurgical procedures

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What is the likelihood that he will have another seizure?

- The literature is extensive on the prognosis after a first seizure
- Factors that increase the likelihood of recurrence include:
 - Abnormal EEG
 - h/o remote symptomatic neurologic event
 - And any evidence for a partial focal onset
- In one study, 407 children were followed after a 1st seizure and 42% had another seizure at a 5 year follow-up
- In another series of 244 patients of all ages, 27% had another seizure within 3 years
- In general, in an otherwise healthy person who has a first tonic-clonic seizure and who has a normal neurologic evaluation, has less than a 50% chance of having another one within the next few years

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Should he be treated and what restrictions should be placed on his activity?

- To treat or not to treat, that is the question!!!
- Knowledge that a generalized convulsion stands a good chance or being an isolated, single event should inform the treatment decision
- Most neurologists will not treat and adopt a wait and see attitude
- Some patients may insist on treatment
 - If medication is prescribed, however, this will simply defer the even more difficult decision of when to discontinue

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Some restrictions on activity for the patient certainly exist:

- A driving restriction is mandatory in most states for 3-12 months after a seizure involving LOC, even if medication is prescribed
- Other reasonable restrictions include:
 - Avoidance of heights
 - Working with dangerous machinery
 - Swimming or bathing alone
 - Avoidance of sleep deprivation
 - Avoidance of sympathomimetic drugs as well as alcohol
 - And certainly, late night FRAT parties are to be avoided

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Case 2: A 36 y/o drunk who can't seem to stop seizing!



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- It is 06:30 and you are about to go off duty when an ALS call comes in to medical control
- EMS: "we are en route with a 36 year old man who is found down and obviously intoxicated."
- There is no obvious trauma
- Patient intermittently seizing for the past 10 minutes
- ETA to your location: 20 minutes



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History & Physical

- Hx: None except that EMS found a Rx for Depakote and Clonidine in the patient's pocket
- PE:
 - BP 180/90, PR 110, RR 20, Pox=96% on RA
 - Head: grossly atraumatic
 - Neck: also atraumatic, but a C-collar was placed
 - Pupils: 2mm with tonic deviation to the right
 - Mouth: bloody from a tongue laceration
 - Neuro: unable to examine, but patient is moving all extremities
- EMS is seeking your advice...



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Questions



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- You ask EMS for a glucometer check, but machine not working; would you recommend empiric dextrose (EMS do not have THIAMINE on board) and why?!



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- EMS: "patient is still seizing and we are having trouble controlling his C-spine and getting IV access; what recommendation(s) would you give them?"




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Pre-hospital possibilities in the absence of IV access


- **Diazepam:** rectally
- **Midazolam:** IM, Buccal or Intranasal
- **Lorazepam:** Intranasal
- **Paraldehyde:** IM


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None IV AED Drug Comparisons in SE

(Baysun et al. Clin pediatric 2005;44:71 (TURKEY))


• Midazolam (0.25mg/kg)	• Diazepam (0.5mg/kg)
• Buccal route	• Rectal route
• 18 of 43 patients responded (78%)	• 19 of 43 responded (85%)
• 5 did not (22%)	• 3 did not (15%)


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Intranasal Lorazepam VS IM paraldehyde (80 subjects)

(Ahmed et al. Lancet 2006)


<ul style="list-style-type: none"> • Lorazepam: • 60 (75%) responded in 10 minutes • Safe • Very effective • Much less invasive 	<ul style="list-style-type: none"> • Paraldehyde: • 49 (61%) responding in 10 minutes • Not as effective • More invasive
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Buccal Midazolam VS Rectal Diazepam(109 & 110)

(McIntyre et al. Lancet 2005)

<ul style="list-style-type: none"> • Buccal Midazolam: • Appears more superior • 61 of 109 (56%) responding with in 10 minutes • With a 5.5% respiratory depression rate 	<ul style="list-style-type: none"> • Rectal Diazepam: • not as effective • The response was 27% (30 out of 110) • Again, about 5.5% respiratory depression
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- 07:00, patient and EMS arrive to your ED
- Vital signs are unchanged
- Rectal temp is 99 F (37.9 C)
- A random blood sugar is 160
- IV access is established
- The patient begins having a generalized seizure.
- **What would you order?**


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In the first 6-10 minutes...

- Lorazepam 4 mg IV can be given over 2 minutes
- May repeat once in 5 minutes if the patient is still seizing


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• It is now 07:10, the patient continues to seize. *Is this patient now in STATUS EPILEPTICUS? What would your second line agent be?*


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The next 10-20 minutes...

- The traditionally accepted 2nd line agent is Phenytoin.
 - Should be loaded at 20mg/kg IV at 150mg/min w/ cardiac monitoring
- Although, in this patient's case, since he probably is already on Depakote, an IV Valproate (Depakene) loading of 30-40 mg/kg is an acceptable alternative
 - Additional 20mg/kg over five minutes can be given


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• The clock approaches 07:50. 50 minutes since his arrival, the patient is still intermittently seizing. *What would your third line agents be for managing this patient in STATUS?*


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From 20-60 minutes...

- If seizures are persistent, one of the following agents can be given. Airway security would be essential, except for valproate; it does not exhibit any CR depression)
- Continuous IV (CIV) Midazolam:
 - Load at 0.2mg/kg; repeat 2-.4mg/kg every five minutes until seizures stop or to a max of 2mg/kg
- CIV Propofol:
 - 1-2mg/kg; repeat 1-2mg/kg boluses until ictus ceases or up to a max of 10mg/kg. Avoid propofol infusion syndrome.
- IV Valproate:
 - 30-40mg/kg loading over 10 min. If still seizing, an additional 20mg/kg over five minutes can be given
- IV Phenobarbital:
 - 20mg/kg IV up to 50-100mg/min


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• 08:15; despite your best efforts, patient continues to seize. You already have him intubated and vented. *What would be your next step?*

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• *For periods of seizing activity exceeding 60 minutes...*


- must institute a **"PENTOBARBITAL COMA"**
 - CIV of Pentobarbital can be started at 5mg/kg and up to 50mg/min
 - May repeat 5mg/kg boluses until seizures stop

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What ancillary tests could you order in the ED while managing this patient?

- CBC
- Chem 7
- Mg, Ca, PO4
- AED levels
- ABG
- Troponin
- Blood & Urine toxicology screens
- CT brain & C-spine
- CXR
- EKG
- ?LP
- Stat bed-side EEG; although, only positive in 50% of the cases


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• *What role, if any, is there for the new AED in the management of status?*

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• **LEVETIRACETAM (KEPPRA):**

- Action not well known
- Renally cleared
- 10% protein bound
- Plasma T1/2 of 6-8 hours
- Only a few promising reports exist regarding its use enterally in the care of S.E.
- An IV formulation is well on the way

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• **TOIRAMATE(TOPOMAX)&ZONISAMIDE(ZONE GRAN):**

- carbonic anhydrase inhibitors
- Administered via the naso-gastric route
- Reported effective in aborting SE
- Have multiple mechanisms of action
- Vigilance must be used in avoiding metabolic acidosis (especially when used in conjunction with propofol)

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• **KETAMINE:**

- Used with success in refractory SE
- Works via its NMDA receptor antagonism and its GABA-A receptor agonism
- Most of the studies on its use in SE are in animal models; its use in humans is still largely experimental (*Borris and associates*)

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• **ISOFLURANE:**

- An inhalational anesthetic
- Shown to abort seizures in refractory SE
- Seizures can recur on discontinuation
- Has many well known complications including a few reports of death and severe intractable hypotension (*Kofke and Colleagues*)


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- **OTHERS:**
- still experimental and need more clarification regarding their use in SE.
- They include:
 - *Steroids*
 - *IVIG*
 - *Plasmapheresis*
 - *ACTH*
 - *Lidocaine*

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CASE 3: A Clumsy Teenager

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- A 15 y/o boy, previously healthy, while eating breakfast, suddenly flung his OJ in the air, cried out loudly and had a convulsion
- Although previously healthy, his family described him as 'clumsy', especially in the mornings
- In the ED, his initial evaluation, including a complete neuro exam, blood tests, and an MRI scan was normal
- PMH was unremarkable except for not liking bright lights and feeling 'queasy' when playing video games

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- An EEG was described as abnormal, with a 'photoparoxysmal' response-generalized spike and wave discharges when a strobe light was turned on
- Because of the EEG result, the family was told that he suffered from a 'seizure disorder' and was given carbamazepine
- Six weeks later, however, he had another convulsion and his teachers reported that he had begun to "stare into space" during classes

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Questions

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- ***Does the boy have epilepsy?***
- By definition, this boy has epilepsy
- He has had at least two seizures not related to a temporary or transient condition

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What type of seizures does he have?

- He has generalized tonic-clonic (grand mal) seizures
- The OJ flinging in the air and the h/o clumsiness are further clues of "myoclonic jerks"
- The staring spells raise, further, the question of absence seizures (petit mal) or CPS
- All the seizure types in this case are generalized-onset seizures, not partial-onset

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What is his actual diagnosis?

- This patient more than likely has an epilepsy syndrome
 - This is a specific syndrome that implies a specific epilepsy syndrome, associated clinical signs and symptoms, and a prognosis
- This patient has a common epilepsy syndrome called "JME" (Juvenile Myoclonic Epilepsy)
- JME is the most common cause of new-onset seizures among adolescents
- JME has a specific cause, treatment and prognosis

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What caused it?

- The etiologic factor is JME
- JME is a genetic disorder
 - Inheritance is often complicated with only 14% of first-degree relatives having the same syndrome
- A generalized seizure usually brings the patient to the doctor
- A careful history often reveals that "myoclonic jerks" have been occurring for months or years
- Absence seizures also occur in 20% of patients with JME
- The seizures often occur in the mornings
- The average age of onset is 14 years
- EEG is highly characteristic with bursts of polyphasic spikes-and-waves
- JME is the epilepsy syndrome most likely to involve photosensitivity
 - Typically flashing lights, including sunlight

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Why did carbamazepine not work and what would the best treatment be??

- One important reason for classifying seizures accurately is that certain antiepileptic drugs make certain seizure types worse
- Carbamazepine, in this case, may worsen myoclonus and absence
- Other drugs that can do the same include:
 - o Gabapentin (neurontin)
 - o Tiagabine (gabatril)
 - o Phenytoin (dilantin)

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JME is usually easy to treat

- Responds completely to valproic acid (Depakote) in more than 86% of cases
- Patients who cannot tolerate valproate, will respond favorably to one of the newer agents
 - o Zonisamide (Zonegran)
 - o Levetiracetam (Keppra)
 - o Topiramate (Topomax)
 - o Lamotrigine (Lamictal), but can worsen myoclonus
- These drug types are effective for JME, although not yet FDA approved for this condition

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How long does he need to take medication?

- Treatment of JME must be lifelong
- It is essential for physicians to recognize this disease and to advise patients accordingly
- More than 90% of the time seizures will recur upon cessation of antiepileptic treatment in JME

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CASE 4: Epilepsy in Late Life

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- A 77 y/o RHD man was brought to his PCP by his wife because “his mind is wandering”, claims the wife
- For the past 2-3/12 the patient sometimes did not answer for up to a minute when spoken to
- Other times, he adamantly insisted that he did not hear her despite looking directly at her when she spoke
- PMH included many years of reasonably controlled hypertension and a small old CVA one year ago that left him with a mild weakness of the left hand

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- O/E, the patient was alert and oriented, but seemed a bit ‘forgetful’
 - HE COULD ONLY RECALL TWO OF THREE WORDS 5 MINUTES LATER
- His hearing was intact
- The neuro exam was normal except for the slight weakness and clumsiness of the left hand
- An MRI of the brain revealed tiny, old cerebral infarctions in the left temporal and right frontal cortical regions
- An EEG was normal

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Questions

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- *What is the differential diagnosis of these events?*
- Several possibilities come to mind:
 - Simple inattention
 - Hearing trouble
 - Daydreaming
 - A dementing process
 - TIAs
 - And Seizures

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- The first four could be ruled out if the patients attention could be gotten during the episodes
 - Quite the contrary, our patient could not respond nor acknowledge a hand in the face during such episodes

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Could these events be TIAs?

- Not likely, since TIAs usually last several minutes to four hours
- TIAs from the carotid circulation produce transient motor weakness sensory changes or monocular blindness
 - They do not produce changes in awareness
- Posterior circulation TIAs can produce an AMS, but usually accompanied by other signs and symptoms that are uncommon with seizures


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Could these events represent EPILEPSY?

- The possibility of seizures in this patient must be considered
- Specifically, NCSE should be entertained
 - The patient can have CPS and/or AS, but it is strange that the patient only has blank stares w/o automatisms and a normal EEG


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What is the "gold standard" in diagnosing epilepsy in this man?

- The "gold standard" is prolonged inpatient EEG recording with simultaneous video, for several days if needed
 - This is useful for the diagnosis of epilepsy in the elderly
 - It is an expensive test and not widely available
 - Can often be non-diagnostic
- In such cases, most neurologists, if other reasonable options are ruled out, suggest a therapeutic and possibly diagnostic trial of an anti-epilepsy drug



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What is the underlying cause of the events in this patient?

- With the history of chronic HTN and multiple old cortical infarctions, 'cerebrovascular disease is the most likely culprit
 - Tests to evaluate such possibility should include:
 - o Carotid and cardiac U/S
 - o EKG and a holter monitor
 - o MRI/MRA of the neck and cerebral vessels
- In this patient, it is possible that the old temporal stroke is the source of the PCS/AS



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- Alzheimer's disease should also be considered, especially with advanced dementia
 - This is not likely in our patient because he did not exhibit any cognitive impairments
- Other causes may include:
 - Structural lesions → can be evaluated with MRI
 - Metabolic factors
 - With the exception of hypo- and hyperglycemia, most metabolic encephalopathies produce a more convulsive seizure and not CPS or AS
 - Infection → such as meningitis, encephalitis and brain abscess


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How should this patient be treated, if epilepsy were his diagnosis?


- With caution and extreme gentleness
- There is no urgency to achieve optimal seizure control with the elderly
 - Control should not be delayed unduly, but a couple of extra weeks usually are acceptable
- This is owing to the fact that declines in hepatic and renal functions in the elderly will allow for a greater accumulation and higher serum drug levels


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What is the best anti-epilepsy drug at this patient's age?!


- Traditional drugs are problematic in the elderly
- the enzyme-inducing drugs, phenytoin, carbamazepine, and phenobarbital may produce interactions with some of the many drugs older patient's take


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- A recent, large Veterans Affairs Cooperative Study in the US addresses this very question
- 593 patients over the age of 60, with a mean age of 72 with new-onset seizures part-took in a randomized, blinded multi-center trial
 - Patients randomized to receive low doses of tegretol (600), lamotrigine (150), and neurontin (1500)
 - The primary end-point was satisfactory treatment for 1 yr
 - There were no statistically significant differences in seizure control
 - Tegretol was the least tolerated with 31% drop-outs, 22% for neurontin and 12% for lamotrigine (p=0.001)
 - 35% of the tegretol arm remained in the study for a year Vs. 49% for neurontin Vs. 56% for lamotrigine
 - This difference was statistically significant for Tegretol Vs. the other two
- Other, newer agents may be more promising and satisfactory, such as Levetiracetam, but not well tested and not yet FDA approved for use as monotherapy in the elderly


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Five minutes for Q's and A's to our panelists


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Thank You

Jamal R. Saadah, M.D.,
 F.A.C.E.P.
 E-mail: drjindubai@yahoo.com

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