NonConvulsive Seizure

Patient presents with alteration of consciousness unexplained by other etiologies AND suspicious for non convulsive seizure OR
subclinical seizures noted on EEG

ABCs
Finger stick glucose

Labs:
CBC w/ Diff, CMP, Urine Drug Screen, Urine Pregnancy Test
If KNOWN epilepsy, order anti-seizure medication levels
IF UNKNOWN, order Magnesium and Phosphate

Seizures Terminate

Patient back to baseline in 15-30 minutes?

Yes

Administer meds. Is there IV access?

Yes

Ativan (Lorazepam): 1-2 mg IV per dose, may repeat in 5 mins, up to 0.1 mg/kg, if not controlled after 2 doses, move on

No

Midazolam: 0.2 mg/kg IM or IV up to max of 10mg

No

Seizures Persist?

Yes

Order neurology consult
Order Continuous EEG
Order Non-contrast Head CT
If imaging reveals lesion, order neurosurgery consult

PRE Status Epilepticus
First round of medication does not cease seizures:
PRE Status Epilepticus

Administer Meds: CHOOSE ONE

- **PREGNANCY OR SEVERE LIVER DISEASE**
  - Fosphenytoin:
    - 20mg PE/kg IV initial bolus. Complete initial bolus. If clinical or electrographic seizures persist, may give add’l 5mg/kg. Rate of up to 150mg PE/min.

- **EEG or clinical exam suggestive of MYOCLONIC SEIZURES**
  - Valproate Sodium (Depakote):
    - 20-40 mg/kg IV, may give add’l 20mg/kg, up to 3-6 mg/kg/min

- **Pt in ICU, PACU, or INTUBATED**
  - Midazolam:
    - Initial dose of 0.2 mg/kg; administer at infusion rate of 2mg/min; followed by continuous infusion of 0.05mg/kg/hr. Titrate to max tolerated dose.

Consider ICU transfer
- Close monitoring of airway - Readiness to intubate
- Consider LP if clinically indicated
- If not already ordered: Order neurology consult Order Continuous EEG

Seizures Persist?
- No
  - Seizures Terminate
- Yes
  - PRE Status Epilepticus

Seizures Persist?
- No
  - PRE Status Epilepticus
- Yes
  - Consider trying another second line agent. (ONLY REPEAT ONCE)
### NonConvulsive Seizure

#### Administer Meds: CHOOSE ONE

<table>
<thead>
<tr>
<th>PREFERRED unless patient meets any criteria below</th>
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[Return to Pathway]
December 16, 2014

NonConvulsive Seizure

Transfer to ICU with cEEG monitoring.

Contraindication to intubation?

- Yes
  - Consider intermittent bolus therapies of valproic acid, levetiracetam, or fosphenytoin.
- No
  - Intubate and consider need for pressors.

Administer Meds: CHOOSE ONE

<table>
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<tr>
<th>Treatment involves continuous infusions. Goal is to titrate to seizure suppression for ≥ 48 hrs. If seizures persist, goal is to titrate to burst suppression for ≥ 48 hrs.</th>
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<tbody>
<tr>
<td>PREFERRED</td>
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<tr>
<td>Second Choice</td>
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<tr>
<td>Third Choice</td>
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</tbody>
</table>

Consult epileptologist.

Seizures Persist?

- Yes
  - Refractory Status
  - Consider Seizure Protocol MRI to be ordered by neuro or epileptologist. Treatment management with assistance from neuro consult and epileptologist. Consider neurosurgery consult.
- No
  - Initiation of maintenance anti-seizure medication. Selection guided by epileptologist.
  - Consider weaning infusion anti-seizure medications/anesthetic agents if seizure free 24-48 hours.
  - Continue cEEG for 24-48 hours once IV anti-seizure medication/anesthetic agents infusions weaned and patient remains seizure free

Transfer out of ICU per ICU transfer criteria

Within 3-4 wks

Follow up in Neurology Clinic with Epileptologist

Maintenance anti-seizure medications:
- Phenytoin, Levetiracetam, Valproate, Lacosamide, Clonazepam, Phenobarbital, Topiramate, Zonisamide, Carbamazepine, Oxcarbazepine
### NonConvulsive Seizure

Administer Meds: CHOOSE ONE

_Treatment involves continuous infusions. Goal is to titrate to seizure suppression for ≥ 48 hrs. If seizures persist, goal is to titrate to burst suppression for ≥ 48 hrs._

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<td>Start at 20 mcg/kg/min with 1-2 mg/kg loading dose. 30-200 mcg/kg/min CI. <strong>Propofol infusion rate = 30–200 mcg/kg/min CI. Use caution when administering high doses (&gt;80 mcg/kg/min) for extended periods of time (i.e., &gt;48 h)</strong></td>
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<td>5-15 mg/kg, may give add’l 5-10 mg/kg: administer at infusion rate of &lt;50 mg/min. 0.5-5 mg/kg/h CI.</td>
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_Return to Pathway_
Initiation of maintenance anti-seizure medication. Selection guided by epileptologist.

Consider weaning infusion anti-seizure medications/anesthetic agents if seizure free 24-48 hours.

Continue cEEG for 24-48 hours once IV anti-seizure medication/anesthetic agents infusions weaned and patient remains seizure free
NonConvulsive Seizure

Seizures Terminate

If patient on cEEG, continue for 24-48 hours once patient remains seizure free.

Known Epilepsy?

Order Routine EEG if not already performed.

Order non-contrast head CT (within 2 hours) if not already ordered. Consider LP if concern for CNS infection.

If imaging reveals lesion, order neurosurgery consult

Treat underlying cause.

Is risk of recurrent seizure high?

Yes

Assess for infection or stressors.

Consider LP if concern for CNS infection.

Consider head CT if concern for head injury, focal neurological examination, or prolonged alteration in mental status.

Engage Social Work

No

Back to baseline?

Yes

Assess for infection or stressors.

Consider LP if concern for CNS infection.

Consider head CT if concern for head injury, focal neurological examination, or prolonged alteration in mental status.

Engage Social Work

No

If patient on cEEG, continue for 24-48 hours once patient remains seizure free.

Maintenance anti-seizure medications:
Phenytoin, Levetiracetam, Valproate, Phenobarbital, Topiramate, Zonisamide, Carbamazepine, Oxcarbazepine

Consider beginning or adjustment of maintenance anti-seizure medication

Patient ready for discharge once all acute medical needs are met

Within 4 weeks

Follow up in Neurology Clinic. If second line agent given, recommend follow-up with epileptologist.
If patient on cEEG, continue for 24-48 hours once patient remains seizure free.
Convulsive Seizure

Must treat acutely with 1st line anti-seizure meds

Seizure persists for >5 min

Is there IV access?

Lorazepam:
2-4mg IV per dose,
may repeat in 5 mins,
up to 0.1 mg/kg, if
not controlled after 2
doses, move on

Midazolam:
0.2 mg/kg IM or IV
up to max of 10mg

Seizures Persist?

Yes

PENDING Status Epilepticus

No

Assess for provoking factors

Order Imaging, labs, EEG

Known Epilepsy?

Yes

Order AED Levels. Assess for infection, stressors, injuries.

No

Consider labs: CMP, CBC, Tox Screen, Urine Pregnancy Test. Consider LP and Imaging

AED levels w/in normal limits?

Yes

Order Labs: CMP, CBC, Tox Screen, Urine Pregnancy Test. Consider LP and Imaging

No

Engage social work

Consider neuro consult.
If imaging reveals lesion, order neurosurgery consult

Imaging: Order non-contrast head CT, (within 2 hours) if not already ordered

Labs: CMP, CBC, Tox Screen, Mg, Phosphate, Urine Pregnancy Test, AED Levels, if not already ordered. Strongly consider LP

EEG Routine: Pt back to baseline Urgent: if altered mental status greater than 30 minutes post convulsions

Consider Labs: CMP, CBC, Tox Screen, Urine Pregnancy Test. Consider LP and Imaging

AED levels w/in normal limits?

Yes

Order Labs: CMP, CBC, Tox Screen, Urine Pregnancy Test. Consider LP and Imaging

No

Engage social work

Maintenance AEDs:
Phenytoin, Levetiracetam, Valproate, Phenobarbital, Topiramate, Zonisamide, Carbamazepine, Oxcarbazepine

Begin or alter maintenance AED, further treatment at discretion of neurology consult and primary service

Patient ready for discharge once all acute medical needs are met

Follow up in Neurology Clinic
Convulsive Seizure

First line of medication does not cease seizures: PENDING Status Epilepticus

- Does the patient have severe liver disease or are they pregnant?
  - No
  - Does the EEG or clinical exam suggest myoclonic seizures?
    - No
      - Is the patient already in the ICU, PACU, or intubated?
        - No
          - Fosphenytoin: 20mg PE/kg IV initial bolus. Complete initial bolus. If clinical or electrographic seizures persist, may give add'l 5mg/kg. Rate of up to 150mg PE/min.

- Yes
  - Order Neurology Consult
  - Order Continuous EEG

- Levetiracetam: 1,000-3,000 mg IV, at rate of 2.5 mg/kg/min IV

- Valproate Sodium: 20-40 mg/kg IV, may give add'l 20mg/kg, up to 3-6 mg/kg/min

- Midazolam: Initial dose of 0.2 mg/kg, administer at infusion rate of 2mg/min; followed by continuous infusion of 0.05mg/kg/hr. Titrate to max tolerated dose.

- Does the patient have severe liver disease or are they pregnant?
  - Yes
    - Consider ICU transfer if: - vitals unstable

Maintain AEDs: Phenytin, Levetiracetam, Valproate, Phenobarbital, Topiramate, Zonisamide, Carbamazepine, Oxcarbazepine

Treat Underlying Cause
Begin or alter maintenance AED per neurologist recommendation
If continuous EEG not yet performed, change order to Stat EEG

Seizures Persist?
- No
  - Patient ready for discharge once all acute medical needs are met
    - Within 4 wks
    - Follow up in Neurology Clinic

- Yes
  - Status Epilepticus

Check with pharmacy
Monitor heart rate
Be aware of risk of bradycardia, heart block, and hypertension
Convulsive Seizure

**Status Epilepticus**

- Transfer to ICU with cEEG monitoring.

**Is there a strong clinical reason to avoid intubation?**

- **Yes**
  - Consider intermittent bolus therapies of valproic acid, leviteracetam, or fosphenytoin.

- **No**
  - Intubate and consider need for pressors

**Midazolam**: Initial dose of 0.2 mg/kg; administer at infusion rate of 2 mg/min; followed by infusion of 0.05-2 mg/kg/hr CI.

**Propofol**: Start at 20 mcg/kg/min with 1-2 mg/kg loading dose. 30-200 mcg/kg/min CI.

**Pentobarbital**: 5-15 mg/kg, may give add'l 5-10 mg/kg; administer at infusion rate of <50 mg/min. 0.5-5 mg/kg/hr CI.

**Propofol infusion rate = 30–200 mcg/kg/min CI. Use caution when administering high doses (>80 mcg/kg/min) for extended periods of time (i.e., >48 h)**

**Consider Seizure Protocol**

- MRI to be ordered by neuro or epileptologist.
- Treatment management with assistance from neuro consult and epileptologist. Consider neurosurgery consult.

**Consult epileptologist.**

**Tritrate to continuous infusion of 3rd line agent to seizure suppression based on cEEG or clinical exam for ≥ 48 hrs**

**Refractory Status**

- **No**
  - Maintain continuous infusion while initiating maintenance AED
  - Maintenance AEDs: Phenytoin, Levetiracetam, Valproate, Lacosamide, Clonazepam, Phenobarbital, Topiramate, Zonisamide, Carbamazepine, Oxcarbazepine

- **Yes**
  - Seizures Persist?
    - **Yes**
      - If seizures persist, goal is to titrate to burst suppression for ≥ 48 hrs
    - **No**
      - Has patient been seizure free for 24-48hrs?
        - **Yes**
          - Stop the cEEG
        - **No**
          - Transfer out of ICU per ICU transfer criteria & continue maint AED
            - Within 3-4 wks
            - Follow up in epilepsy clinic

**Consider weaning infusion of third line meds**

**Have you weaned the continuous infusion of 3rd line meds?**

- **Yes**
  - Stop the cEEG

- **No**
  - Has the patient been seizure free for 24-48hr after stopping infusion of 3rd line meds?
    - **Yes**
      - Transfer out of ICU per ICU transfer criteria & continue maint AED
        - Within 3-4 wks
        - Follow up in epilepsy clinic
Management algorithm for generalized CONVULSIVE status epilepticus

NB: Algorithm intended for ongoing convulsive activity > 5 min or recurrent convulsive seizures without regaining consciousness
See reverse for management options for non-convulsive status or frequent clinical seizures

0-5 minutes

- Perform Basic Life Support: Airway, Breathing, Circulation; Give supplemental oxygen
- Obtain IV access, blood glucose, vital signs, blood pressure, EKG, and cardiac monitoring
- Send CMP, CBC, ABG, alcohol and AED levels, urine pregnancy, and toxicology screen
- Call Rapid Response (5-8893); Be prepared to call a code (5-5555) and intubate if necessary

0-5 minutes

IV Thiamine 100 mg; IV Dextrose 50%, 50 cc
If hypoglycemic or alcoholic or if glucose or history unavailable

| IV Lorazepam 0.1 mg/kg up to 4mg/dose | Alternatives, if no IV access:
| May repeat q 5 min | IM Midazolam 10 mg (max 10 mg)
| (max 8-10 mg or respiratory depression) | OR
| | IM Lorazepam 4 mg (max 10 mg)
| | OR
| | Rectal Diazepam 20 mg (max 30 mg)

5-10 minutes

IV Fosphenytoin* 20 PE/kg @ 150 PE/min

Alternatives:
IV Phenytoin: 20 mg/kg @ 50 mg/min
OR
IV Valproate** 30 mg/kg @ 3 mg/kg/min

* Monitor EKG and BP with fosphenytoin and phenytoin; Monitor for drug extravasation with phenytoin
** Consider valproate as first line in known Idiopathic Generalized Epilepsy; Avoid in women of child-bearing age if possible

10-20 minutes

- Intubate patient
- Begin IV anesthetic with anti-epileptic properties
  Titrate to EES and monitor blood pressure

Anesthetic Options:
Midazolam 0.2 mg/kg bolus then 0.05 mg/kg/h
OR
Propofol* 2 mg/kg bolus then 30 mcg/kg/min
OR
Pentobarbital 5 mg/kg bolus then 0.5 mg/kg/h

* Caution with prolonged use and high doses of propofol due to increased risk of propofol infusion syndrome;
  See order set for rates > 65 mcg/kg/min

Convulsions CONTINUE

Convulsions STOP

Obtain Head CT

Persistent altered mental status

Obtain continuous EEG Monitoring†

† Continuous EEG Monitoring should be obtained for all patients not recovering baseline mental status - including those receiving IV anesthesia
Alternative anti-epileptic drugs for frequent seizures, non-convulsive status epilepticus or refractory status epilepticus:
NB: Most of these medications are not first line treatments for convulsive status epilepticus but may be appropriate as adjunctive or occasionally first-line treatments for frequent seizures and some cases of non-convulsive status epilepticus. They may also be used when electrographic seizures persist despite management on the reverse side of the card.

- **IV Lacosamide (Vimpat)** 200-400 mg @ 200 mg/30 min then 200 mg BID*
  *Dose adjustment in renal or liver failure
  *monitor EKG and BP during load and for at least 24 hours
- **IV Levetiracetam (Keppra)** 3000 mg @ 2 mg/kg/min then 1500 mg BID
  *Dose adjustment in renal failure
- **IV Phenytoin (Dilantin)** 15-20 mg/kg @ 50 mg/min then 100mg TID*
  *Dose adjustment in liver failure, renal failure (CrCl <10ml/min) and age >70
  *monitor EKG and BP during load and for at least 24 hours
- **IV Phenobarbital** 20 mg/kg at 60 mg/min then 0.5-1.5 mg/kg BID
  *Dose adjustment in renal or liver failure
- **IV Valproate** 25-30 mg/kg at 3 mg/kg/min then 1-4 mg/kg/h OR 8-20 mg/kg TID
  *Dose adjustment in renal or liver failure
- **PO Clonazepam (Klonopin)** 0.5-1 mg TID
  *Dose adjustment in renal or liver failure
- **PO Topiramate (Topamax)** 50-200 mg x 1 then 50 mg PO BID
  *Caution with pre-existing metabolic acidosis and propofol

**Indications for 24-hour Continuous Video EEG Monitoring:**
1. One of the following clinical diagnoses associated with an increased risk of subclinical seizures AND altered or fluctuating mental status (including sedated/intubated patients):
   - Recent clinical evidence of status epilepticus or seizures
   - Traumatic brain injury
   - Intracerebral hemorrhage
   - Subarachnoid hemorrhage
   - Subdural hemorrhage
   - Anoxic brain injury
   - CNS infection
2. Unexplained altered or fluctuating mental status in any patient
3. Subtle clinical signs in patients with coma (e.g. eye twitching/nystagmus)
4. Recurrent clinical seizures

**How to obtain emergent video EEG monitoring:**
NB: Not all of the above situations require emergent video EEG monitoring, off-hours emergent studies will be triaged by the EEG Physician on call

1. Page the EEG Physician on-call (5-5514)
2. Place an order for a 24-hour VEEG
3. Neurology resident should videotape patient with designated camera if clinical signs can be appreciated at the bedside prior to start of video EEG

July 2014