UNM Pediatric Status Epilepticus Pathway

Indication: children > 1 month - 18 years with:
• seizure > 5 minutes in duration OR
• recurrence of seizure without return to baseline

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POC Glucose

Order if applicable:
- iStat (VBG and electrolytes)
- Chem10
- CBC
- Calcium (total and ionized)
- Magnesium
- AED Levels

- Head CT or MRI
- Utox
- LP (especially if <2 years, immune suppressed, or recent antibiotics)
- Blood cx, UA, Urine cx

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Stabilization Phase

Did patient already receive appropriate 1st dose of benzodiazepine?

No

<table>
<thead>
<tr>
<th>Route</th>
<th>Drug</th>
<th>Dose</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>IntraMUSCULAR</td>
<td>midazolam</td>
<td>5 mg if 13-40 kg</td>
<td>10 mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 mg if &gt; 40 kg</td>
<td></td>
</tr>
<tr>
<td>IntraNASAL</td>
<td>midazolam</td>
<td>0.2 mg/kg</td>
<td>10 mg</td>
</tr>
<tr>
<td>IntraVENOUS</td>
<td>lorazepam</td>
<td>0.1 mg/kg</td>
<td>4 mg</td>
</tr>
<tr>
<td>IntraVENOUS</td>
<td>diazepam</td>
<td>0.2 mg/kg</td>
<td>10 mg</td>
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</tbody>
</table>

Yes

If clinical seizure continues

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<tr>
<td>IntraVENOUS</td>
<td>Lorazepam</td>
<td>0.1 mg/kg</td>
<td>4 mg</td>
</tr>
<tr>
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<td>diazepam</td>
<td>0.2 mg/kg</td>
<td>10 mg</td>
</tr>
</tbody>
</table>

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First Line Therapy

If clinical seizure continues

NOTIFY NURSE TO DRAW MED FROM PIXIS

<table>
<thead>
<tr>
<th>Route</th>
<th>Drug</th>
<th>Dose</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>IntraVENOUS</td>
<td>Fosphenytoin</td>
<td>20 mg/kg</td>
<td>1500 mg</td>
</tr>
<tr>
<td>IntraVENOUS</td>
<td>Levetiracetam</td>
<td>60 mg/kg</td>
<td>4500 mg</td>
</tr>
</tbody>
</table>

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Second Line Therapy

If clinical seizure continues

Consult Pediatric Neurology
Consult PICU
Order stat continuous EEG
Proceed to Refractory Status Epilepticus Pathway

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REFERENCES:
UNM Pediatric Status Epilepticus Pathway
Refractory Status Epilepticus

**MIDAZOLAM INFUSION**

- **Bolus:** 0.2 mg/kg\(^1\) [Max 10 mg]
- **Start infusion at 0.1 mg/kg/hour\(^2\)**

If seizure continues

- **Bolus:** 0.15 mg/kg \textbf{AND} Increase infusion rate by 0.05-0.1 mg/kg/hr \(^1\) [Repeat bolus and rate-increase q 15 minutes until seizure cessation]

Notes:
- If a rate of 1 mg/kg/hr fails to control seizures for >30 minutes, advance to next agent
- No max rate reported; note that rates above 2 mg/kg/hr (max 50 mg/hr) have been used in adults

**ADDITIONAL ANTIConvULSANTS**

- **IV phenobarbital** 20 mg/kg, max 1000 mg\(^1\)
- **IV valproic acid** 20 mg/kg, max 1000 mg\(^2\)

- \(^1\)Check phenobarbital serum level 2 hours after load
- \(^2\)Valproic acid contraindicated if suspected or known metabolic disease, caution in children <2 years

**PENTOBARBITAL INFUSION**

- **Bolus:** 5 mg/kg over 30 minutes.
- Repeat as needed to burst suppression IBI 10 seconds, up to 30 mg/kg (6 boluses total)\(^4\)

**ONCE BURST SUPPRESSION IS ACHIEVED:**

- **Start infusion at 1.0 mg/kg/hr\(^4\)**
- **Stop midazolam infusion**

- **Increase infusion by 0.5 mg/kg/hr as needed to maintain BS**

Notes:
- **Monitor serum levels**
- **Max rate:** 5 mg/kg/hr
- **If IBI becomes prolonged, hold infusion until IBI < 20 seconds, then resume infusion at dose 0.5 mg/kg/hr less than previous dose

**REFERENCES:**
4. Phelps S. Pediatric Injectable Drugs, 2013

**TRANSFER TO PICU**

There is no clear evidence to guide therapy in this phase. Select either of the following options.

- **ADD**
- **ITIONAL ANTIConvULSANTS**
- **MIDAZOLAM INFUSION**
- **PENTOBARBITAL INFUSION**

If seizure continues

**WEAN:**

- **Decrease rate by 0.5 mg/kg/hr q 6 hours**

Continue infusion until 24-48 hours seizure-free

Seizure cessation

40-60 minutes
### UNM Pediatric Status Epilepticus Pathway

**Super refractory status epilepticus treatment options**

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#### KETAMINE INFUSION

(Continue midazolam infusion, see below)

- **Bolus**: 2.5 mg/kg x 2 q 5 minutes
- **Start infusion at**: 8 mcg/kg/min (0.5 mg/kg/hr)
- **Decrease midazolam infusion to**: 0.05 mg/kg/hr

- **Increase rate by**: 8 mcg/kg/min (0.5 mg/kg/hr) every 15 minutes as needed to achieve resolution of clinical and/or electrographic seizures
- **Continue Ketamine infusion until**: 48 hours seizure-free
- **Wean by**: 8 mcg/kg/min (0.5 mg/kg/hr) q 6 hours

**Notes**

- Max rate: 55 mcg/kg/min (3.5 mg/kg/hr)
- Doses as high as 160 mcg/kg/min (10 mg/kg/hr) have been used in adults

**Reference:**


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#### LACOSAMIDE BOLUS

**Weight <40 kg**

- **Bolus**: 10 mg/kg
- **Maintenance**: 10 mg/kg/day div BID (start 12 hours later)

**Weight >40 kg**

- **Bolus**: 200—400 mg
- **Maintenance**: 200 mg bid

**Notes**

- Max maintenance dose: 14 mg/kg/day
- Max infusion rate: 60 mg/min

**Reference:**

4. Phelps S. Pediatric Injectable Drugs, 2013

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#### PROPOFOL INFUSION

- **Bolus**: 3 mg/kg
- **Start infusion at**: 50 mcg/kg/min (3 mg/kg/hr)
- **Stop midazolam infusion**

- **Increase rate by**: 8 mcg/kg/min (0.5 mg/kg/hr) every 15 minutes as needed to achieve burst suppression (goal IBI 10 seconds)
- **Once burst suppression is achieved → continue infusion for 24 hours → wean to 50% max rate for 6-12 hours → wean to 25% max rate for 6-12 hours → stop**

- **Monitor ABG, LFTs, CK q 6 x 24 hours, then q12**

**Notes**

- Max duration: 48 hours
- Max dose: 300 mg/kg/min (18 mg/kg/hr)
- **Contraindications**: ketogenic diet, metabolic disorder, egg allergy

**Reference:**

3. Phelps S. Pediatric Injectable Drugs, 2013

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#### VALPROIC ACID INFUSION

- **Bolus**: 20-40 mg/kg, then start infusion
  - **Obtain level 1 hour after bolus**

- **Start infusion**
  - **Rate**: 1 mg/kg/hr
  - **With PHENOBARbital or phenytoin, rate**: 2 mg/kg/hr
  - **With PENTOBARbital, rate**: 4 mg/kg/hr

- **Increase rate by**: 1 mg/kg/hr as needed to achieve serum concentration (80-100 mg/L)
  - **Obtain level 2 hours after rate increase**

**Notes**

- Max rate: 6 mg/kg/hr
- **Wean**: 1 mg/kg/hr q 2 hours
- **Contraindicated if suspected or known metabolic disease, caution in children <2 years**

- **Monitor CBC, CMP daily**

**Reference:**

3. Phelps S. Pediatric Injectable Drugs, 2013

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#### TOPIRAmate BOLUS

- **Bolus**: 5 mg/kg
- **Maintenance**: 5 mg/kg/day div BID (start 12 hours later)

**Notes**

- Seizure-free after 24 hours: Continue 5 mg/kg/day div BID
- Seizures continue after 24 hours: Increase dose by 5 mg/kg/day q day
- Max dose reported in children: 25 mg/kg/day
- Max dose reported in adults: 1600 mg/day

- **Monitor BMP daily**

**Reference:**

### IMMUNOTHERAPY

#### METHYLPREDNISONE
- 30 mg/kg/day IV x 3 days

**Notes**
- Max: 1 gram/day
- Consider antiviral/antibiotic agents if infectious studies pending

#### IMMUNOGLOBULINS
- 1 gm/kg x 2 days

**Notes**
- Ensure all auto-antibody/infectious titers are drawn prior to administration

#### PLASMA EXCHANGE
- 5 exchanges
- Frequency: every other day

**Notes**
- Ensure all auto-antibody/infectious titers are drawn prior to administration

If an autoimmune or paraneoplastic etiology is confirmed and patient is not responding to above treatments, consider rituximab or cyclophosphamide.

Reference:

### KETOGENIC DIET

<table>
<thead>
<tr>
<th>Step 1: Draw Screening Labs</th>
<th>Step 2: Develop a Feeding Plan</th>
<th>Step 3: Diet Initiation</th>
<th>Step 4: Diet Monitoring</th>
<th>Step 5: Discharge Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>- CBC</td>
<td>Estimate caloric needs:</td>
<td>Remove all dextrose from fluids</td>
<td>BMP, Mg, Phos daily</td>
<td>If weaning diet, can decrease by 0.5:1 ratio every week until negative urine ketones then resume a regular diet</td>
</tr>
<tr>
<td>- CMP</td>
<td>For intubated patients: Use the BMR (see below)</td>
<td>Change all medications to low-carbohydrate forms</td>
<td>UA q8hrs until 4+ ketones then q12hrs</td>
<td>If continuing diet, family needs a gram scale, urine ketone strips, glucometer, extensive dietitian education, and close follow-up as an outpatient</td>
</tr>
<tr>
<td>- Mg and Phos</td>
<td>For extubated patients: Use the BMR x 1.2-1.4</td>
<td>Slowly advance continuous feeds to goal and condense feeds further as tolerated</td>
<td>Blood glucose q4hrs until 4+ ketones then q8hrs</td>
<td></td>
</tr>
<tr>
<td>- Plasma acylcarnitine profile</td>
<td>Estimate fluid needs: 0-10 kg: 100 mL/kg/day 10-20 kg: 1000mL + 50mL/kg/day 20-40 kg: 1500mL + 20mL/kg/day &gt;40kg: use adult fluid needs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Urine organic acids</td>
<td>Determine starting ratio: &lt;18 months: Initiate at 3:1 ratio and adjust as needed &gt;18 months: Initiate at 4:1 ratio and adjust as needed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Plasma amino acids</td>
<td>Determine formula recipe: Ketocal 4:1 liquid is 1.5 kcal/mL Ketocal 4:1 or 3:1 powder is 7 kcal/g (Displacement: 1ml/g)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Free and total carnitine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 25-hydroxy vitamin D3</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- Zn and Se</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CO2 level</th>
<th>Bicarbonate (split 8/12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>1 mEq/kg</td>
</tr>
<tr>
<td>13-15</td>
<td>2 mEq/kg</td>
</tr>
<tr>
<td>&lt;12</td>
<td>3 mEq/kg</td>
</tr>
</tbody>
</table>

**Blood sugar Intervention**
- < 40 mg/dL (with autonomic instability, tinnitus, sweating, dizziness or pallor)
  1. Give 15-30 mL of juice PO (or 3-5 oz unflavored Pedialyte via tube)
  2. Wait 15 min & recheck blood sugar levels. If <40 mg/dL give an additional 15 mL juice (or 3 oz Pedialyte) & recheck blood sugar until >40 mg/dL

Reference:

Last Updated September, 2018 by Seema Bansal MD (Department of Neurology) and Julie Tuccillo PharmD (Department of Pharmacy)