Management of convulsive status epilepticus (SE)

Early SE 5-10 minutes

- Check and maintain airway, breathing and circulation and vitals
- Get IV access
- Check glycemia (fingerstick glucose)
- Draw blood for blood gases, complete blood count and biochemical tests
- If alcohol-related SE: administer IV thiamine 100 mg followed by dextrose

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dose</th>
<th>Max. dose (incl. repeat if applicable)</th>
<th>Repeat (if needed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lorazepam</td>
<td>0.1 mg/kg (up to 4 mg/dose)</td>
<td>8 mg</td>
<td>once in 10 min</td>
</tr>
<tr>
<td>Diazepam</td>
<td>0.1 mg/kg (5-10 mg/dose)</td>
<td>20 mg</td>
<td></td>
</tr>
<tr>
<td>Midazolam</td>
<td>0.1-0.2 mg/kg (up to 10 mg/dose)</td>
<td>20 mg</td>
<td></td>
</tr>
<tr>
<td>Phenobarbital*</td>
<td>10-20 mg/kg</td>
<td>700 mg</td>
<td></td>
</tr>
<tr>
<td>Clonazepam</td>
<td>1 mg</td>
<td>2 mg</td>
<td></td>
</tr>
</tbody>
</table>

All medications (except for phenobarbital) may be repeated once after 5-10 min

Established SE 10-30 minutes or failure of initial treatment

- Investigate the underlying aetiology with neuroimaging (CT or MRI)
- Manage any metabolic imbalances or hypertension
- Perform EEG (check for non-convulsive SE, monitor response to treatment)
- Inform intensive care unit

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dose</th>
<th>Max. rate</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fosphenytoin</td>
<td>30 mg/kg</td>
<td>150 mg/min</td>
<td>Contraindicated in AV block, severe ↓BP; Avoid in myoclonic SE; Monitor ECG and BP</td>
</tr>
<tr>
<td>Phenytoin</td>
<td>20 mg/kg (max 1500 mg PE)</td>
<td>50 mg/min</td>
<td>Contraindicated in severe liver dysfunction, mitochondrial disease. Can cause pancreatitis and thrombocytopenia</td>
</tr>
<tr>
<td>Sodium valproate</td>
<td>30-40 mg/kg (max 3000 mg)</td>
<td>10 mg/kg/min (over 10-20 min)</td>
<td>Reduce dose in severe renal failure</td>
</tr>
<tr>
<td>Levetiracetam</td>
<td>60 mg/kg (max 4500 mg)</td>
<td>2-5 mg/kg/min (over 15 min)</td>
<td></td>
</tr>
<tr>
<td>Lacosamide</td>
<td>200-400 mg (max 600 mg)</td>
<td>5-10 mg/min (over 15-30 min)</td>
<td>Contraindicated in grade II-III AV block</td>
</tr>
<tr>
<td>Phenobarbital</td>
<td>10-15 mg/kg (max 20 mg/kg)</td>
<td>50 mg/min</td>
<td>Contraindicated in porphyria, liver failure, respiratory depression. Needs cardiorespiratory monitoring</td>
</tr>
</tbody>
</table>

PE, phenytoin equivalent; BP, blood pressure
### Refractory SE

- Transfer to intensive care unit
- Intubate, induce therapeutic coma
- Treat hyperthermia
- EEG monitoring (response to treatment [goal is seizure suppression] and level of sedation)

### Medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Loading dose</th>
<th>Maintenance*</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midazolam</td>
<td>0.1-0.3 mg/kg</td>
<td>0.05-0.5 mg/kg/h</td>
<td>Accumulation in obesity, elderly and kidney failure.</td>
</tr>
<tr>
<td>Propofol</td>
<td>2 mg/kg</td>
<td>5-10 mg/kg/h initially, reduce to 1-3 mg/kg/h</td>
<td>PRIS, cardiorespiratory depression</td>
</tr>
<tr>
<td>Thiopental</td>
<td>5 mg/kg</td>
<td>0.5-5 mg/kg/h</td>
<td>Respiratory and cardiovascular depression, accumulation, paralytic ileus, immunosuppression, lingual edema, hypernatremia</td>
</tr>
<tr>
<td>Ketamine</td>
<td>2-7.5 mg/kg/hr</td>
<td>0.3-5 mg/kg/hr</td>
<td>Tachycardia, arrhythmias (incl. asystole), hypertension</td>
</tr>
</tbody>
</table>

*PRIS, propofol infusion syndrome: cardiovascular collapse, lactic acidosis, hypertriglyceridemia and rhabdomyolysis

### Super-refractory SE

- Manage in intensive care unit jointly with intensivist/anaesthetist
- Identify and treat rare causes (metabolic, genetic, mitochondrial, rare infections, autoimmune, paraneoplastic, etc)

There are no randomised controlled trials on treatment of super-refractory SE: the available evidence is based on case reports and small case series (Class IV evidence).

### Alternative AEDs
- Topiramate: 5 mg/kg/d in children, 500-1000 mg/d in adults (risk of hyperammonemia)
- Pregabalin: mean dose 350 mg/d (risk of worsening myoclonic seizures)
- Perampanel: lower (4mg [2-12mg]/day, titrated up to 12 mg/day) & higher dose (16-32mg/day, no titration) are both safe in comatose individuals [expert]

### Other therapies
- Magnesium sulphate 2-6 g/h (target serum level of 3.5 mmol/L)
- Lidocaine IV
- Inhalational anesthetics: isoflurane, desflurane, or sevoflurane (risk of thrombosis/embolism, bleeding, ileus)
- Hypothermia (32 and 36°C) for 24-48 h
- Ketogenic diet (risk of acidosis, hypoglycemia, hyperlipidemia)

### Immunological therapies

1. **1st line:** IV Methylprednisolone (MP) 1 g/day 3-5 days MP or prednisolone 1 mg/kg/day
2. IV IgG (0.4 g/kg/day) over 5 days
3. Plasma exchange

4. **2nd line:** rituximab, tocilizumab, anakinra, cyclophosphamide

### Neurosurgery or neurostimulation
- Resection of well-localised ictal (seizure) onset zone
- Vagal nerve stimulation
- Responsive neurostimulation
- Deep brain stimulation
- Repetitive transcranial magnetic stimulation

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