Updates in Seizure Management: Nothing To Get All Shook Up About

Jennifer Bushwitz, PharmD
Clinical Pharmacy Specialist, NeuroCritical Care
Shands at the University of Florida

Melissa Ruble, PharmD, BCPS
Emergency Medicine Clinical Pharmacist
St. Anthony’s Hospital

Disclosure

• I do not have a vested interest in or affiliation with any corporate organization offering financial support or grant monies for this continuing education activity, or any affiliation with an organization whose philosophy could potentially bias my presentation

Pharmacist Objectives

• Upon completion of this activity, the participant should be able to:
  – Discuss the updated status epilepticus (SE) guidelines
  – Summarize the main advantages and disadvantages of the new antiepileptic drugs
  – Describe any alternative administration routes and bioequivalence issues that arise with the use of these medications

Technician Objectives

• Upon completion of this activity, the participant should be able to:
  – Define status epilepticus
  – Review updated treatment recommendations for status epilepticus
  – Summarize the main advantages and disadvantages of new epileptic drugs
  – Describe current challenges concerning the administration of new epileptic drugs

Status Report

Jennifer Bushwitz, PharmD
Clinical Pharmacy Specialist, NeuroCritical Care
Shands at the University of Florida

“...all attempts at classification of epileptic seizures are hampered by our limited knowledge of the underlying pathological processes within the brain, and that any classification must of necessity be a tentative one and will be subject to change with every advance in the scientific understanding of epilepsy”

–H. Gastaut, International League Against Epilepsy
Neurocritical Care Society Guidelines

- Published 2012; started writing 2008
- Class
  - I: Intervention is useful and effective. Treatment benefits clearly exceed risks
  - IIa: Evidence/expert opinion suggest intervention is useful/effective. Treatment benefits exceed risk
  - IIb: Strength of evidence/expert opinion about intervention usefulness/effectiveness is less well established. More data are needed; however, using this treatment when warranted is not unreasonable
  - III: Intervention is not useful or effective and may be harmful. Benefit does not exceed risk

Status Epilepticus Defined

- “Sufficient in length” and “often enough”
- Continuous or repetitive seizure activity persisting for at least 30 minutes without recovery of consciousness between attacks
- Seizure lasting more than 5 minutes or 2 or more seizures during which patient does not return to baseline
- Five or more minutes of either
  - Continuous clinical or electrographic seizures
  - Recurrent seizure activity without return to baseline

Likelihood of Spontaneous Remission
Clinical Timeline

Infarction

Decreased likelihood of spontaneous resolution

Spontaneous resolution

Mortality 32%

2 min 5 - 10 min 30 min 30 - 59 min >60 min

Idus

Clinical Timeline

Seizure

Status Epilepticus

Generalized Convulsive Status Epilepticus

- Tonic/clonic movements, mental status impairment
- Electrolyte abnormalities, rhabdomyolysis
- Lower mortality rate at hospital discharge: 9-21%

Non-convulsive Status Epilepticus

Common Causes

1. Drugs
   - Antiepileptic drug (AED) therapy non-compliance
   - Alcohol
   - Toxicity
2. Foreign Materials
   - Infection
   - Tumor
   - Trauma
   - Stroke
3. Misc
   - Metabolic abnormalities
   - Cardiac arrest/anoxia

Classification and Treatment

Seizure

Status Epilepticus

Generalized Convulsive Status Epilepticus

Non-convulsive Status Epilepticus

Classification and Treatment

Seizure

Status Epilepticus

Nonconvulsive Status Epilepticus

- Seizures on electroencephalogram (EEG) without clinical findings
- High prevalence in critically ill patients with impaired mental status
- Often delayed diagnosis in the ICU
- Higher mortality rate at hospital discharge: 18-52%
Emergent Control Therapy

- Timing: <5 minutes
- Goal: termination of seizure
- Agent of choice: benzodiazepine
  - Lorazepam (Ia), midazolam (Ia), diazepam (IiA)
  - Multiple routes of administration
- Adverse effects: respiratory depression, hypotension
  - Lower incidence than placebo
  - Airway compromise due to seizures vs benzodiazepines

**VA Cooperative Study**

- 1990-1995
- 16 VA medical centers
- Overt or subtle generalized convulsive SE
- Treatment
  - Lorazepam 0.1 mg/kg
  - Phenobarbital 15 mg/kg
  - Diazepam 0.15 mg/kg + phenytoin (PHT) 18 mg/kg
  - PHT 18 mg/kg
- Second treatment: PHT
- Third treatment: phenobarbital

**RAMPART**

- Randomized, double blind, phase 3, noninferiority
- Convulsive status epilepticus
- Treatment
  - 10 mg IM midazolam
  - 4 mg IV lorazepam
- Primary endpoint: Termination of seizures prior to ED arrival without need for rescue therapy

**Emergent Control Therapy Options**

<table>
<thead>
<tr>
<th>Lorazepam (IV)</th>
<th>Midazolam (IM)</th>
<th>Diazepam (PR)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Available Routes</strong></td>
<td><strong>Preferred dose</strong></td>
</tr>
<tr>
<td>Longer duration, largest amount of clinical trial data</td>
<td>IV, PO</td>
<td>IV: 0.1 mg/kg</td>
</tr>
<tr>
<td>Multiple dosage forms, short duration</td>
<td>IV, IM, buccal, nasal</td>
<td>IM: 0.2 mg/kg</td>
</tr>
<tr>
<td>Multiple dosage forms, short duration</td>
<td>IV, PR, PO</td>
<td>IV: 0.15 mg/kg</td>
</tr>
<tr>
<td><strong>Recommended max per dose</strong></td>
<td>4 mg</td>
<td>10 mg</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>5-10 min</td>
<td>5 min</td>
</tr>
<tr>
<td><strong>Alternative dosing strategies</strong></td>
<td>N/A</td>
<td>0.1-0.3 mg/kg</td>
</tr>
<tr>
<td><strong>Rectal gel</strong></td>
<td>IM/buccal/intranasal</td>
<td>10-20 mg PR</td>
</tr>
</tbody>
</table>

**Classification and Treatment**

- Seizure
- Status Epilepticus
  - Generalized Convulsive Status Epilepticus
    1. Emergent Control Therapy
    2. Urgent Control/Maintenance Therapy
  - Non-convulsive Status Epilepticus
**Urgent Control Therapy**

- **Timing**
  - 5-10 minutes
  - Immediately following administration of benzodiazepine

- **Goal**
  - SE resolved: begin maintenance therapy
  - SE not resolved: terminate seizure activity

- **Agent of choice**
  - Controversial
  - Preferred options: valproic acid (IlaA), PHT/ fosphenytoin (IlaB), phenobarbital (IlbC), levetiracetam (IlbC)

---

**Urgent Control Therapies: Dosing and Monitoring**

<table>
<thead>
<tr>
<th>Agent</th>
<th>TDM</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common Brands</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cerebyx ®</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dilantin ®</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depakote®</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lumin *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keppra *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Drug level timing</strong></td>
<td>IV: 2 hrs</td>
<td>PO: 24 hrs</td>
<td>Trough</td>
<td>IV: 2 hrs</td>
<td>PO: trough</td>
</tr>
<tr>
<td><strong>Time to steady state</strong></td>
<td>3-5 days</td>
<td>2-4 days</td>
<td>15-20 days</td>
<td>0.5-1.5 days</td>
<td></td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td>Total: 10-20 mg/kg/day</td>
<td>Total: 50-100 mg/kg/day</td>
<td>15-40 mg/kg/day</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td><strong>Loading dose</strong></td>
<td>15-20 mg/kg (max 3.5 gm)</td>
<td>20-40 mg/kg</td>
<td>15-20 mg/kg</td>
<td>1000-3000 mg</td>
<td></td>
</tr>
<tr>
<td><strong>Maintenance dose</strong></td>
<td>5-6 mg/kg/day</td>
<td>15 mg/kg/day</td>
<td>2 mg/kg/day</td>
<td>3-2 gm/day</td>
<td></td>
</tr>
</tbody>
</table>

*mcg/mL; higher goals may be targeted in SE

**Classification and Treatment**

- **Seizure**
  - Status Epilepticus
    - Generalized Convulsive Status Epilepticus
    - Non-convulsive Status Epilepticus
  - Emergent Control Therapy
  - Urgent Control/Maintenance Therapy
  - Refractory Status Epilepticus

**Refractory Status Epileptics**

- Ongoing status epilepticus not responsive to first and second line therapies
- Timing: 20-60 min after urgent SE control therapy administered
- Goal: stop seizures (clinical/EEG)
- General approach
  - Obtain seizure control with continuous infusion IV (CIVI) agents titrating to individual goal based on continuous EEG
  - Initiate maintenance therapy with longer acting AEDs
  - Wean CIVI agents in 24-48 hours
  - Resume CIVI if seizures recur for an additional period of time

**Therapeutic Options for RSE**

- Insufficient evidence to advocate any one therapy over another
- Frequently recommended agents
  - Midazolam (IlaB)
  - Pentobarbital (IlbB)
  - Propofol (IlbB)
- Other therapies
  - Consider if not previously administered
  - IlaB: valproate
  - IlbC: phenoxytoin/fosphenytoin, levetiracetam, lacosamide, topiramate, phenobarbital
Therapeutic Options for Refractory Status Epilepticus

<table>
<thead>
<tr>
<th></th>
<th>Pentobarbital</th>
<th>Midazolam</th>
<th>Propofol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loading dose</td>
<td>5-15 mg/kg*</td>
<td>0.2 mg/kg</td>
<td>1-2 mg/kg</td>
</tr>
<tr>
<td>Infusion rate</td>
<td>0.05-2 mg/kg</td>
<td>0.05-2 mg/kg</td>
<td>10-200 mcg/kg/min</td>
</tr>
<tr>
<td>CRI rate</td>
<td>0.5-5 mg/kg/hr</td>
<td>12 mg/hr</td>
<td>0.05-2 mg/kg/hr</td>
</tr>
<tr>
<td>Max recommended</td>
<td>1.5 mg/kg/hr</td>
<td>50 mg/kg/min</td>
<td>30-200 mcg/kg/min</td>
</tr>
<tr>
<td>infusion rate at</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUFI rate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loading concentration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypotension,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>respiratory/cardiac</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>depression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elimination</td>
<td>Hepatic</td>
<td>Hepatic active metabolite renally eliminated)</td>
<td>Hepatic, extra hepatic</td>
</tr>
<tr>
<td>Affect AED</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>concentration</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*May administer an additional 5-10 mg/kg.

Brophy GM, et al. Neurocrit Care 2012;17:3-23

Alternative Therapies

- Limited options for patients poorly responsive to conventional AEDs
- Pharmacologic options
  - Ketamine
  - Inhaled anesthetics
  - Corticosteroids/IVIG
- Non-pharmacologic
  - Hypothermia
  - Electroconvulsive/magnetic stimulation
  - Surgical therapy
  - Ketogenic diet

Clinical and Treatment Timeline

- Spontaneous resolution
- Emergent 0-5 min
- Urgent 5-10 min
- Infarction
- Decreased likelihood of spontaneous resolution
- Refractory 20-60 min
- >60 min

Summary

- Failure of first/second line agents is considered to be treatment refractory status epilepticus.
- Treatment for refractory status epilepticus focuses on using general anesthetics to terminate seizure activity and prevent further neuronal injury. The agents of choice for managing refractory status epilepticus are pentobarbital, midazolam and propofol.
- Numerous other AEDs are available for consideration however their role is less well defined.

New Antiepileptic Drugs
Are we there yet?

Melissa Ruble, PharmD, BCPS
St. Anthony’s Hospital
St. Petersburg, FL
Why the Sudden Urge for New Drugs?

• Within the last 20 years multiple new medications have emerged to treat seizure disorders.
• Treatment of resistant seizures remains a problem for over 1/3 of patients despite advances in therapy with at least 2 to 3 agents.
• New therapies aim to provide seizure control with low adverse drug effect profiles.

Goal: No Seizures and No Side Effects

• Ideal antiepileptic drug (AED) properties
  – Improved efficacy over older therapies
  – Tolerability
  – Safety
  – Favorable pharmacokinetics
  – Broad spectrum of activity
  – Low teratogenic potential

New AEDs

• Ezogabine (Potiga™)
• Zonisamide (Zonegran®)
• Tiagabine (Gabitril®)
• Perampanel (Fycompa®)
• Vigabatrin (Sabril®)
• Lacosamide (Vimpat®)

Ezogabine (Potiga™)

Indication
FDA approved in June 2011
Adjunctive treatment of partial-onset seizures uncontrolled by current medications

Mechanism of action
Potassium channel opener
May also exert effects on GABA currents

Available routes
PO

Starting dose
100 mg PO TID

Maintenance dose
200 to 400 mg PO TID

Renal dosing (CrCl <50)
50 mg PO TID to MDD of 600 mg/day

Administration considerations
Must swallow tablets whole
High fat foods can increase concentrations

Advantages

<table>
<thead>
<tr>
<th>Absorption</th>
<th>Rapid (Tmax 0.5 - 2 hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution</td>
<td>Extensive (Vd 2 - 4 L/kg)</td>
</tr>
<tr>
<td>Metabolism</td>
<td>Glucuronidation and acetylation No involvement of CYP450 enzymes</td>
</tr>
</tbody>
</table>

Disadvantages

<table>
<thead>
<tr>
<th>Bioavailability</th>
<th>60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein binding</td>
<td>80%</td>
</tr>
<tr>
<td>Renal adjustments</td>
<td>Yes</td>
</tr>
<tr>
<td>Administration</td>
<td>Must swallow tablets whole</td>
</tr>
<tr>
<td>Adverse reactions</td>
<td>Urinary retention, CNS side effects, QT prolongation</td>
</tr>
<tr>
<td>Half-life (T50)</td>
<td>Short half-life – dosed three times daily</td>
</tr>
<tr>
<td>Special alerts</td>
<td>Retinal abnormalities and skin discoloration Withdraw medication slowly</td>
</tr>
</tbody>
</table>
### Zonisamide (Zonegran®)

**Indication**
- FDA approved March 2000
- Adjunct treatment of partial seizures in children > 16 years of age and adults with epilepsy

**Mechanism of action**
- Reduction in neuronal firing by blocking sodium channels
- Prevents influx of calcium

**Available routes**
- PO

**Preferred dose**
- 100 mg PO daily

**Maintenance dose**
- May increase dose to 200 mg/day after 2 weeks

**Renal dosing (CrCl < 50)**
- Not recommended

### Advantages

<table>
<thead>
<tr>
<th>Absorption</th>
<th>Rapid and complete (Tmax 2 – 4 hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution</td>
<td>Extensive (Vd 1.5 L/kg)</td>
</tr>
<tr>
<td>Bioavailability</td>
<td>100%</td>
</tr>
<tr>
<td>Protein binding</td>
<td>Low at 40%</td>
</tr>
<tr>
<td>Half-life (T50)</td>
<td>Long (105 hrs)</td>
</tr>
</tbody>
</table>

### Disadvantages

| Administration   | Only available as oral capsules
|                  | Must be swallowed whole |
| Adverse reactions| CNS side effects, metabolic acidosis, oligohidrosis (children) |
| Hypersensitivity | Absolute contraindication in sulfonamide hypersensitivity |
| Renal dosing     | Renal adjustments are necessary |
| Age limitations  | Insufficient data for patients older than 65 years |
| Metabolism       | Metabolized through CYP450 enzyme system – substrate of CYP3A4 and 2C19 |

### Tiagabine (Gabitril®)

**Indication**
- FDA approved 1997
- Adjunctive therapy in adults and children ≥ 12 years of age in the treatment of partial seizures

**Mechanism of action**
- Inhibits the reuptake of GABA

**Available routes**
- PO

**Dosing**
- 4 mg PO once daily for 1 week, may increase by 4-8 mg weekly to response or 56 mg daily in 2-4 divided doses
- Start dosing lower and titrate slower

**Pediatric dosing**
- Children 12-18 years of age should increase to max of 32 mg/day

### Advantages

| Absorption       | Rapid (Tmax of 45 mins)
|                  | Lipid soluble – crosses the blood brain barrier |
| Bioavailability  | 90%                                  |
| Hepatic/Renal dosing | No adjustments are necessary |
| Administration   | Oral suspension formulations can be compounded |

### Disadvantages

<table>
<thead>
<tr>
<th>Protein binding</th>
<th>96 %</th>
</tr>
</thead>
</table>
| Metabolism      | Substrate of CYP3A4
|                 | Dosing is dependent on current AEDs |
| Adverse reactions| CNS side effects |
| Administration  | Only oral formulations are available
|                 | Must take with food |
**Perampanel (Fycompa®)**

**Indication**
FDA approved in 2012
Adjunctive treatment for partial onset seizures with or without secondary generalized seizures
Children ≥ 12 years and adults

<table>
<thead>
<tr>
<th>Mechanism of action</th>
<th>Selective, noncompetitive AMPA glutamate receptor antagonist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available routes</td>
<td>PO</td>
</tr>
<tr>
<td>Dosing in patients receiving enzyme-inducing AED</td>
<td>4 mg PO HS, may increase by 2 mg/day weekly based upon response to 8 – 12 mg PO HS</td>
</tr>
<tr>
<td>Dosing in patients NOT receiving enzyme-inducing AED</td>
<td>2 mg PO HS, may increase by 2 mg/day weekly based on response to 8 – 12 mg PO HS</td>
</tr>
</tbody>
</table>

**Advantages**

<table>
<thead>
<tr>
<th>Absorption</th>
<th>Rapid (Tmax 0.5 – 2 hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food dosage</td>
<td>Does not affect AUC</td>
</tr>
<tr>
<td>Bioavailability</td>
<td>100%</td>
</tr>
<tr>
<td>Half-life (T50)</td>
<td>Long (105 hrs)</td>
</tr>
</tbody>
</table>

**Disadvantages**

<table>
<thead>
<tr>
<th>Protein binding</th>
<th>95 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metabolism</td>
<td>Primarily by CYP3A4</td>
</tr>
<tr>
<td>Dosing is dependent on current AEDs</td>
<td></td>
</tr>
<tr>
<td>Hepatic/Renal dosing</td>
<td>Adjustments are necessary</td>
</tr>
<tr>
<td>Administration</td>
<td>Only oral formulations are available</td>
</tr>
</tbody>
</table>
| Special alerts  | • Use in caution in patients with pre-existing aggressive behavior or psychosis
• Avoid driving or operating machinery
• Increased risk of falls in elderly |

**Vigabatrin (Sabril®)**

**Indication**
Treatment of infantile spasms
Treatment of refractory complex partial seizures not controlled by usual treatments in patients ≥ 16 years of age

| Mechanism of action | Synthesized in 1974 as analog of GABA
Irreversibly inhibits GABA transaminase
Increases levels of GABA within the brain |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Available routes</td>
<td>PO</td>
</tr>
<tr>
<td>Starting dose</td>
<td>500 mg PO BID; increase daily dose by 500 mg at weekly intervals</td>
</tr>
<tr>
<td>Maintenance dose</td>
<td>3 g/day</td>
</tr>
</tbody>
</table>

**Advantages**

<table>
<thead>
<tr>
<th>Absorption</th>
<th>Rapid (Tmax of 1 hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution</td>
<td>Extensive (Vd 1.1 L/kg)</td>
</tr>
<tr>
<td>Metabolism</td>
<td>No significant CYP450 enzyme involvement</td>
</tr>
<tr>
<td>Protein binding</td>
<td>No protein binding</td>
</tr>
</tbody>
</table>
| Bioavailability | 100%
Tablets = oral solution |

**Disadvantages**

<table>
<thead>
<tr>
<th>Renal dosing</th>
<th>Dose adjustments are necessary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Half-life (T50)</td>
<td>Short half-life (7.5 hrs)</td>
</tr>
<tr>
<td>Administration</td>
<td>Only available orally</td>
</tr>
</tbody>
</table>
| Adverse reactions | Weight gain
Decreases ALT and AST in 90% of patients |
| Age restrictions | Mostly studied in younger patients |
| Special alerts | Risk of permanent vision loss
SHARE program |
**Lacosamide (Vimpat®)**

**Indication**
- FDA approved 2009
- Adjunctive therapy in the treatment of partial-onset seizures in patients ≥ 17 years of age
- C-V controlled substance

**Mechanism of action**
- Enhances the slow inactivation of sodium channels
- Inhibits repetitive firing

**Available routes**
- PO, IV

**Starting dose**
- 50 mg PO/IV BID; increase at weekly intervals by 100 mg daily

**Maintenance dose**
- 200 - 400 mg daily

**Advantages**
- Absorption: Rapid (Tmax 1 – 4 hrs)
- Not affected by food
- Bioavailability: 100%
- Formulations: PO and IV
- Protein binding: Only 15%
- Drug interactions: No interactions with other AEDs
- Tolerability: Good tolerability compared with other agents

**Disadvantages**
- Half-life (T50): Short (BID dosing)
- Hepatic/Renal dosing:
  - Not recommended in patients with severe hepatic impairment
  - Dose supplementation is necessary if patient receives dialysis
- Dependence:
  - Psychological dependence may be possible due to euphoria-type reactions
- Adverse reactions:
  - May prolong PR interval; EKG recommended at baseline and at steady state
  - CNS side effects

**Non-Oral Routes of Administration**
- Rectal
- Skin
- Buccal
- Nasal
- Inhaled
- Direct delivery to the CNS

**Intranasal Administration**
- Ideal intranasal properties
  - Potent medication < 20 mg/dose
  - Low molecular weight < 1000 Daltons
  - Excellent water solubility
  - Isotonic to slightly hypertonic
  - Stable in processing and storage
  - Compatible with sprayer component
  - Rapidly absorbed

**No IV? No Problem**
Alternative Administration Routes
Intranasal Benzodiazepines

- 1st choice
  - Midazolam
- Other options
  - Diazepam
  - Lorazepam
  - Clonazepam

Things to Consider

- Increased nasal mucus production
  - Common with actively seizing patients
  - Could decrease absorption
  - Suction patient’s nasal cavity before administering
- Insert spray device fully into the nasal vestibule and aim laterally toward tubinates
- Special formulations or IV solutions?

Intrapulmonary Medications

- Rapid absorption and onset
- Easy to use
- Large surface area
- Medication is delivered via carotid directly to the brain
- Propofol and midazolam are currently being studied

Inhaled Propofol

- Properties
  - Excellent anti-seizure profile
  - Rapid onset
  - Short duration of action
- Propofol hemisuccinate
  - Water-soluble prodrug
  - Well tolerated
  - Slower onset but still rapid
  - Need to metabolize to active metabolite

Inhale Midazolam

- Rapid onset permits several new uses for midazolam in epilepsy therapy
- Administered using a miniaturized portable inhaler system
- Great for patients experiencing a seizure aura
  - Helps prevent full-blown seizure

Conclusion

- Response to AED in newly diagnosed epilepsy is only 50%.
- There is a need for new AED with increased safety profiles.
- Many more medications are in the pipeline using virus transfer mechanisms and gene transfers.
- As pharmacists we can help inform others about the new options in seizure management along with alternative administration routes when necessary.
References


Questions?