Partner Veterinary
EMERGENCY & SPECIALTY CENTER

You Need to Calm Down (the brain)

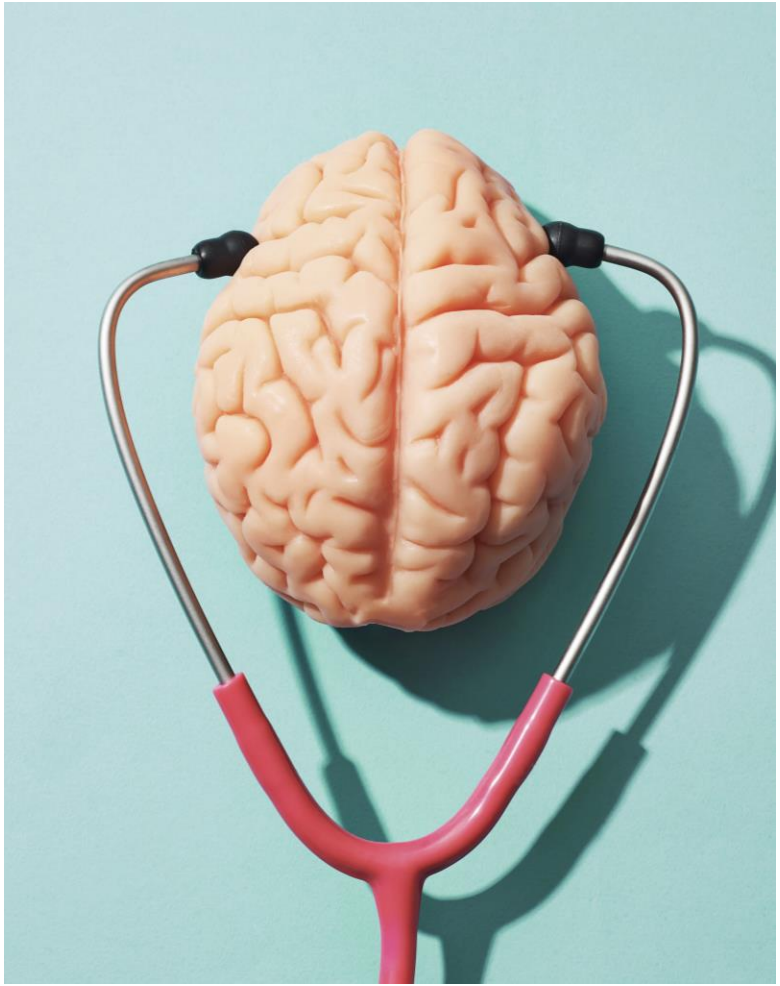
Pillars of Small Animal Seizure Management

Megan Wolfe, VMD, MS, DACVIM (Neurology)

Learning Objectives

- Indications for starting AEDs
- Goals of treatment
- Common AEDs
- Clinical decision making
- Briefly: ER seizure control

AED = anti-epileptic drug



Golden Rules of Seizure Management

- Make sure the episode is a seizure
- Know when to start medications
- Define your treatment goals
- Start with first line AEDs
- Max out one drug before starting another
- Manage clusters and status epilepticus as needed

Make Sure the Episode is a Seizure

- Pre-ictal, ictal, post-ictal phases
- Ictal phase ~30 seconds – 5 minutes
- Autonomic signs
- Change in muscle tone (often increased)
- Cats: focal facial twitching, altered mentation, ptyalism...
- Videos are your friend

Look for an underlying cause

Extra-cranial	Intracranial	Idiopathic epilepsy
• Hypoglycemia • Hyponatremia • Toxins • Neoplasia / paraneoplastic • Hepatic disease	• Neoplasia • Autoimmune • Vascular • Infectious	• Diagnosis of exclusion!

Characteristics of Idiopathic Epilepsy

- Diagnosis of exclusion!
- 6 months – 6 years old at the time of the first seizure
- Normal inter-ictal neurologic exam
- Normal CBC/Chem, Blood pressure, bile acids (esp. young animals)
- Normal brain MRI / CSF tap

Do I need to refer for MRI??

› Vet Rec. 2020 Nov 14;187(10):e89. doi: 10.1136/vr.105647. Epub 2020 Apr 17.

Estimation of the prevalence of idiopathic epilepsy and structural epilepsy in a general population of 900 dogs undergoing MRI for epileptic seizures

Rachel Hall [1], Julien Labruyere [2], Holger Volk [1 3], Thomas James Cardy [4 5]

Affiliations + expand

PMID: 32303666 DOI: 10.1136/vr.105647

- 45% of all cases had structural disease
- 31% of dogs with idiopathic epilepsy were over age 6
- Factors significantly associated with diagnosis:
  - Age (younger = epilepsy, congenital, MUE)
  - Breed (small breed = MUE) (large breed = neoplasia)

Front Vet Sci. 2022 Aug 19:9:956648. doi: 10.3389/fvets.2022.956648. eCollection 2022.

Prevalence of idiopathic epilepsy and structural epilepsy in 74 Boxer dogs in a referral hospital

Tina Loncarica [1], Federica Balducci [1], Marco Bernardini [1 2]

Affiliations + expand

PMID: 36061109 PMCID: PMC9437913 DOI: 10.3389/fvets.2022.956648

- 5/74 Boxers (6.8%) were diagnosed with idiopathic epilepsy
- 66/74 (81.8%) were diagnosed with neoplasia
  - Boxers ages 6 months – 6 years: 67%
  - Boxers >6 years: 96.7%
- 23% of dogs with neoplasia had a normal neuro exam

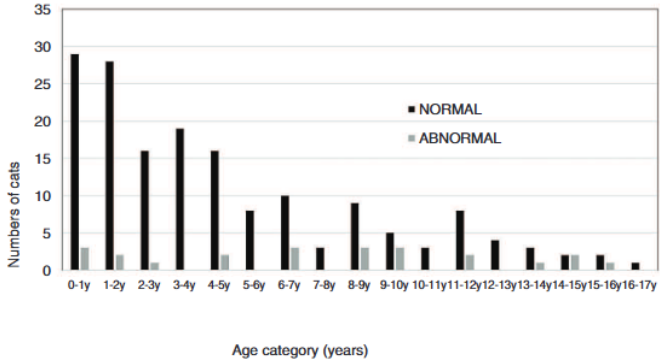
Vet Rec. 2017 Jun 24;180(25):610. doi: 10.1136/vr.104142. Epub 2017 Apr 6.

Magnetic resonance imaging findings in epileptic cats with a normal interictal neurological examination: 188 cases

F Raimondi [1], N Shihab [1], R Gutierrez-Quintana [2], A Smith [3], R Trevail [1], D Sanchez-Masian [4], P M Smith [5]

Affiliations + expand

PMID: 28386032 DOI: 10.1136/vr.104142



- Cats with a normal inter-ictal exam: 85% had normal MRI
- Biggest contributing factors for structural disease:
  - Age > 6 years
  - Abnormal inter-ictal neurologic exam

Maintenance Seizure Control

When do you start medications?

What are your treatment goals?

Patient with one single seizure

- Physical exam
- Neurologic exam
- Baseline workup (CBC, Chemistry, blood pressure, +/- bile acids)
- Signalment and history

Patient with one single seizure

- Physical exam
- Neurologic exam
- Baseline workup
- Signalment and history

All normal?
Ok to hold off on medications for now!

Patient with one single seizure

- Physical exam
- Neurologic exam
- Baseline workup
- Signalment and history

Idiopathic epilepsy: diagnosis of exclusion

- 6 months – 6 years old
- Normal physical/neuro exam
- Normal extra-cranial workup
- Normal MRI/CSF tap

Patient with one single seizure

- Physical exam
- Neurologic exam
- Baseline workup
- Signalment and history

Abnormal neuro exam?
Metabolic disease?
Toxin?
Signalment high risk for brain disease?

Start meds! and consider referral







Patient with repeat seizures

- Physical exam
- Neurologic exam
- Baseline workup (CBC, Chemistry, blood pressure, +/- bile acids)
- Signalment and history
- **Seizure frequency and pattern**

Patient with repeat seizures

Seizure frequency and pattern – start meds if:

- More than 1 seizure every 4-6 months
- Cluster seizures or status epilepticus
- Seizures or post-ictal period are detrimental to patient / family QOL

Cluster seizures or status epilepticus:

- Start a maintenance AED...
- … **and** establish a rescue protocol / "cluster buster"

Treatment Goals

- 50% reduction in seizure frequency
- Good QOL not limited by seizure frequency or medication side effects
- Minimize number of seizures in a cluster

75% of dogs with idiopathic epilepsy can be well-controlled on 1 or 2 maintenance AEDs

Factors that contribute to picking the "Right" drug:

- Efficacy
- Side effects
- Owner/patient compliance
- +/- type of seizure, underlying cause

Common Medications

Phenobarbital

Potassium Bromide

Zonisamide

Levetiracetam

Journal of Veterinary Internal Medicine

ACVIM Consensus Statement | Open Access

2015 ACVIM Small Animal Consensus Statement on Seizure Management in Dogs

M. Podell, H.A. Volk, M. Berendt, W. Löscher, K. Muñana, E.E. Patterson, S.R. Platt

First published: 22 February 2016 | https://doi.org/10.1111/jvim.13841 | VIEW METRICS

Phenobarbital

- Binds at GABAa channels --> increases Cl --> hyperpolarizes the neuron
- Highly protein-bound
- Primarily metabolized by the liver
- Auto-induction of liver enzymes (p450 system)
- Successful monotherapy in ~80% of dogs
- **Starting** dose: 2-4 mg/kg PO q12h

Highly recommended for effective monotherapy

Phenobarbital: Monitoring

CBC/Chemistry in 2-3 weeks, q6 months long-term

Monitor for:

- Liver enzyme elevation (auto-induction)
- Blood dyscrasias/bone marrow toxicity
- True hepatotoxicity (idiosyncratic or dose-dependent)
    - Elevated pre/post bile acids
    - Functional liver failure
    - Sick pet

Phenobarbital: Monitoring

Pheno level in 2-3 weeks, q6 months long-term

Goal: 20-40 ug/ml

Peak and trough levels??

- Usually not necessary
- Consider trough if patient always has a seizure when next dose due
- Ideally just keep the timing consistent

No serum separator tubes!

Phenobarbital: Other Considerations

Phenobarbital can affect thyroid testing longterm (decreases T4, fT4, +/- increased TSH)

Phenobarbital will increase clearance of:

- Keppra
- Zonisamide
- Clorazepate

No serum separator tubes!

Phenobarbital: Cats

1.5-4 mg/kg PO q12-**24h**

Possible subclinical cytopenias

Minimal risk of liver enzyme elevation

Journal of Feline Medicine and Surgery
1–5

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This paper was handled and processed by the European Editorial Office (ISFM) for publication in *JFMS*
Sage

Once-a-day oral treatment with phenobarbital in cats with presumptive idiopathic epilepsy

Abtin Mojarradi[1], Steven De Decker[2] and Sofie Van Meervenne[3]

Abstract

Objectives Phenobarbital (PB) q12h is the most common treatment recommendation for cats with recurrent epileptic seizures. Medicating cats may be challenging and result in decreased quality of life for both cat and owner. The aim of this retrospective study was to evaluate treatment with oral PB q24h in cats with presumptive idiopathic epilepsy.

Methods Nine cats with presumptive idiopathic epilepsy, receiving oral PB q24h, were included in a retrospective descriptive study.

Results Seizure remission was achieved in 88% (8/9) of the cats and good seizure control in 12% (1/9) of the cats, treated with a mean dose of oral PB of 2.6 mg/kg q24h (range 1.4–3.8 mg/kg). No cats required an increase of their PB frequency at any time during a mean follow-up period of 3.5 years (range 1.1–8.0 years). No cats displayed side effects or issues with compliance at the last recorded follow-up.

Conclusions and relevance Once-a-day administration of PB for feline epilepsy was safe and resulted in satisfactory seizure control for the nine cats included in this study. The results of this study justify exploring this topic further in larger prospective studies.

Phenobarbital

Good option for:

- Most patients with epilepsy
- Families willing to follow up for bloodwork
- Cats (try SID dosing)

Contraindications:

- Underlying liver disease
- Compliance concerns
- Patients severely affected by polyphagia, PU/PD

Potassium Bromide

- Br enters neurons via GABA-activated Cl channels --> hyperpolarization
- Half-life: 15.2 days
- Effective monotherapy in ~70% of dogs
- Starting dose:
  - 30 mg/kg PO q24h (monotherapy)
  - 40 mg/kg PO q24h (with phenobarbital)
  - Can split into two doses if desired
- Renally excreted; no hepatic metabolism

Cats?? NO!

Journal of Veterinary Internal Medicine

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Moderate recommendation, likely to be effective

Potassium Bromide Monitoring

- CBC/Chem annually
  - Pseudohyperchloremia
  - Small reported risk of pancreatitis
- Bromide level 3-4 months after dose or diet change, and annually
  - Monotherapy: 1000-3000 mcg/mL
  - With Pheno: 800-2500 mcg/ml

Potassium Bromide and Diet

Renal elimination varies directly with Cl intake

High dietary chloride --> more Bromide excreted --> lower bromide level

Low dietary chloride --> less Bromide excreted --> higher bromide level

The exact amount of chloride in the diet doesn't really matter....

But changes in dietary chloride **will** affect bromide levels

Potassium Bromide

Good option for:

- Most epileptic patients
- Infrequent seizures
- Compliance issues (once daily)
- Large dogs (inexpensive)

Contraindications:

- Cats
- Side effects (PU/PD/PP, ataxia)
- Pancreatitis
- Inconsistent diet
- Need for rapid seizure control

Zonisamide

- Acts on sodium and calcium channels, carbonic anhydrase inhibitor
- Starting dose (dogs and cats):
  - 5-7 mg/kg PO q12h (monotherapy)
  - 7-10 mg/kg PO q12h (with pheno)

Newer studies:
~60-75% positive response

low recommendation, may not be effective….
but much has changed in 10 years

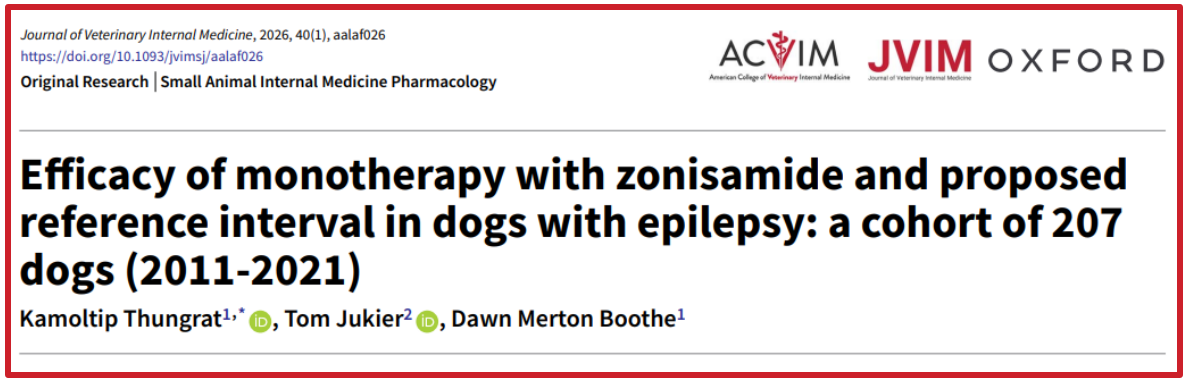
Zonisamide Monitoring

- Side effects: GI upset, +/- behavioral changes
- CBC/Chemistry every 6 months
  - Weak carbonic anhydrase inhibitor
- Phenobarbital increases ZN clearance by 50% and shortens half life
  - Higher doses of ZN needed when patient is also on pheno
- ZN will increase phenobarbital levels

Zonisamide Monitoring

+/- monitoring levels??

- No documented therapeutic index in dogs *
  (recently published paper may change this...)
- Goal level: ~10-55 ug/ml
- Measured 1-2 weeks after starting



Journal of Veterinary Internal Medicine, 2026, 40(1), aalaf026
https://doi.org/10.1093/jvimsj/aalaf026
Original Research | Small Animal Internal Medicine Pharmacology

Efficacy of monotherapy with zonisamide and proposed reference interval in dogs with epilepsy: a cohort of 207 dogs (2011-2021)

Kamoltip Thungrat[1,*], Tom Jukier[2], Dawn Merton Boothe[1]

Zonisamide

Good option for:

- Most epileptics (dogs and cats)
- Families averse to Pheno/KBr side effects
- Clients unable to do frequent drug level monitoring

Contraindications:

- Smaller patients (smallest capsule 25mg)

Levetiracetam

- Acts on SV2A receptors
- Renal metabolism
- Elimination half-life: 4-8 hours
- Very few side effects
- 30-60 mg/kg PO q8h (IR) or q12h (ER)
  - Dogs on pheno may need higher doses
  - Renal disease: slight dose-reduction
- Do not split or crush ER/XR tablets

low recommendation, may not be effective

A single-blinded phenobarbital-controlled trial of levetiracetam as mono-therapy in dogs with newly diagnosed epilepsy

N. Fredsø [a,*], A. Sabers [b], N. Toft [c], A. Møller [d], M. Berendt [a]

[a] Department of Veterinary Clinical and Animal Sciences, Faculty of Health and Medical Sciences, University of Copenhagen, Dyrlaegevej 16, 1870 Frederiksberg C, Denmark
[b] The Epilepsy Clinic, Department of Neurology, University State Hospital (Rigshospitalet), Blegdamsvej 9, 2100 Copenhagen Ø, Denmark
[c] National Veterinary Institute, Section for Epidemiology, Technical University of Denmark, Bülowsvej 27, 1870 Frederiksberg C, Denmark
[d] Centre of Functional Integrative Neuroscience, Aarhus University/Aarhus University Hospital, Nørrebrogade 44, 8000 Aarhus, Denmark

- No significant change in seizure control with Keppra
- Significant improvement in seizure control with pheno (P = .013)
- Keppra 10-20 mg/kg PO q8h used in this study...higher doses needed?

Received: 23 February 2024 | Accepted: 17 May 2024
DOI: 10.1111/jvim.17128

STANDARD ARTICLE

Journal of Veterinary Internal Medicine Open Access ACVIM American College of Veterinary Internal Medicine

Factors influencing serum concentrations of levetiracetam in dogs with epilepsy

Marine Saint-Maxent[1] | Tristan Juette[2] | Joane Parent[1] | Aude Castel[1] | Thomas Parmentier[1,3]

- Keppra 99-216 mg/kg/day needed to achieve serum level of 20 ug/ml (33-72 mg/kg q8h)
- Only half of these dogs were on Keppra monotherapy
- This study could not evaluate efficacy of Keppra monotherapy

Levetiracetam: Cats

- Cats: 500mg ER PO q24h
- Do not split or crush ER/XR tablets
- Efficacy not proven, but appears safe and well-tolerated

Received: 15 November 2017 | Revised: 19 February 2018 | Accepted: 7 March 2018

DOI: 10.1111/jvim.15129

STANDARD ARTICLE

Journal of Veterinary Internal Medicine Open Access

ACVIM American College of Veterinary Internal Medicine

Serum levetiracetam concentrations and adverse events after multiple dose extended release levetiracetam administration to healthy cats

Heidi Barnes Heller[1] | Martin Granick[1] | Mathew Van Hesteren[1] | Dawn M. Boothe[2]

Levetiracetam Monitoring

- CBC/Chem every 6 months
  - No hepatic metabolism (renal excretion)
  - Very few side effects reported
- +/- levels??
  - No published therapeutic index for dogs
  - Keppra 99-216 mg/kg/day needed to achieve serum level of 20 ug/ml (33-72 mg/kg q8h) - this level extrapolated from human medicine
  - Dogs on phenobarbital need **higher** doses of Keppra
  - Renal disease: dose **reduce**

Received: 23 February 2024 | Accepted: 17 May 2024
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Keppra

Good option for:

- Cats (500mg ER q24h)
- Patients/families very averse to side effects or monitoring *
- Episodes that may or may notable a seizure
- Seizures from exogenous toxins
- Emergency seizure control

Contraindications:

- Severe renal disease
- ER/XR only available as 500mg and 750mg – TID dosing?
- Patients with refractory epilepsy (young, healthy epileptics...)

Factors that contribute to picking the "Right" drug:

- Efficacy
- Side effects
- Owner/patient compliance
- +/- type of seizure, underlying cause

JAVMA

Comparison of caregivers' assessments of clinical outcome in dogs with idiopathic epilepsy administered levetiracetam, zonisamide, or phenobarbital monotherapy

Bryanna R. Gristina, BS; Rennie J. Waldron, DVM, DACVIM; Julie A. Nettifee, MS; Karen R. Muñana, DVM, MS, DACVIM*

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Received October 31, 2022
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doi.org/10.2460/javma.22.10.0469

OBJECTIVE
To investigate caregivers' assessments of outcome in dogs with idiopathic epilepsy (IE) administered levetiracetam (LEV), zonisamide (ZNS), or phenobarbital (PB) monotherapy.

ANIMALS
100 dogs with IE administered LEV (n = 34), ZNS (31), or PB (35) monotherapy between January 1, 2003, and February 6, 2019, and survey responses from their caregivers.

PROCEDURES
Information on duration of therapy, adverse effects (AEs), and outcome was obtained from medical record review and caregiver questionnaire.

RESULTS
A significant improvement in mean quality of life score was reported during monotherapy (7.7; SD, 2.14) compared to before treatment (6.25; SD, 2.63; $P < .0001$), with no difference identified between monotherapy groups. Compared to ZNS monotherapy, dogs prescribed PB monotherapy had a significantly younger median age at seizure onset (2.6 vs 4.3 years; $P = .024$). A significant relationship was identified between the occurrence of reported AEs and monotherapy group, with a higher prevalence in the PB group (77% [27/35]) and a lower prevalence in the ZNS group (39% [12/31]; $P = .0066$). Treatment failure rates for PB, LEV, and ZNS monotherapy were 51%, 35%, and 45%, respectively, with failure attributed most commonly to inadequate seizure control. No significant difference was identified between groups with respect to rate of or time to failure.

CLINICAL RELEVANCE
Most caregivers reported a favorable outcome with administration of LEV, ZNS, or PB monotherapy to dogs with IE. Phenobarbital is associated with the highest prevalence of AEs but no difference in quality of life score. Prospective controlled studies are needed to further compare the efficacy and safety of these monotherapies in dogs with IE.

The future of seizure control?

Imepitoin

- Once daily
- No levels required
- Minimal side effects

Journal of Veterinary Internal Medicine

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First published: 22 February 2016 | https://doi.org/10.1111/jvim.13841 | VIEW METRICS

Highly recommended for effective monotherapy

For Reference: Seizure medications for Dogs

	Starting Dose	Monitoring	"Max" dose
Phenobarbital	2-4 mg/kg PO q12h	CBC/Chem and pheno level 2-3 weeks after dose change, and q6 months long-term	Level of 35-40 ug/ml, or side effects
Bromide	30 mg/kg/day (monotherapy) 40 mg/kg/day (with pheno)	CBC/Chem and bromide level 3-4 months after dose/diet change, q12 months long-term	Level ~3 mg/ml, or side effects
Zonisamide	5 mg/kg PO q12h (monotherapy) 7 mg/kg PO q12h (with pheno)	CBC/Chem every 6 months	~10 mg/kg PO q12h
Levetiracetam	30-60 mg/kg PO q12h (ER) or q8h (IR)	CBC/Chem every 6 months	~60 mg/kg per dose

For Reference: Seizure medications for Cats

	Starting Dose	Monitoring	"Max" dose
Phenobarbital	1.5-4 mg/kg PO q12-24h	CBC/Chem and pheno level 2-3 weeks after dose change, and q6 months long-term	Level of 35-40 ug/ml, or side effects
Bromide	NO	NO	NO
Zonisamide	5 mg/kg PO q12h (monotherapy) 7 mg/kg PO q12h (with pheno)	CBC/Chem every 6 months	~10 mg/kg PO q12h
Levetiracetam	500mg ER tab PO q24h or 30-60mg/kg (IR) PO q8h	CBC/Chem every 6 months	~60 mg/kg per dose

When to adjust meds?

- Remember your treatment goals
  - Frequency
  - Side effects
- Keep a seizure log!

How to adjust meds??

- Start with one medication
- Titrate up until you "max out" that medication
- THEN, start a second medication (while continuing the first)

Communication with owner re: seizure frequency is **essential**

Example of Adjusting Phenobarbital

- Start phenobarbital 64.8mg q12h
- Check level 3 weeks later --> 25 ug/ml
  - Seizures well controlled --> no changes
  - Seizures poorly controlled --> increase dose to target a higher level

$$\frac{Dose1}{Level1} = \frac{Dose2}{Level2}$$

Example of Adjusting Phenobarbital

- Start phenobarbital 64.8mg q12h
- Check level 3 weeks later --> 25 ug/ml
  - Seizures well controlled --> no changes
  - Seizures poorly controlled --> increase dose to target a higher level

$$\frac{Dose1}{Level1} = \frac{Dose2}{Level2}$$

$$\frac{64.8}{25} = \frac{Dose2}{Level2} \qquad \frac{64.8}{25} = \frac{97.2}{Level2} \qquad \frac{97.2 \times 25}{64.8} = Level2$$

New expected level = ~37.5

Example of Adjusting Phenobarbital

- Start phenobarbital 64.8mg q12h
- Check level 3 weeks later --> 25 ug/ml
  - Seizures well controlled --> no changes
  - Seizures poorly controlled --> increase dose to target a higher level
- Recheck pheno level on 97mg BID --> 36 ug/ml
  - "maxed out" on pheno
  - Seizures well controlled --> no changes
  - Seizures poorly controlled --> add on a second drug

Example of Adjusting Bromide

- Start Bromide 1000mg q24h
- Check level 3 months later --> 1.7 mg/ml (1700 mg/l)
  - Seizures well-controlled --> no change
  - Seizures poorly controlled --> increase dose

$$(Level2 - Level1) \times .02 = mg/kg/day$$

(in mg/l or ppm)

$$(2300 - 1700) \times .02 = 12mg/kg/day$$

change dose by this much

If medications are not working – ask yourself:

- What is "good control" for **this patient**?
- Do I need better maintenance control, or better cluster control?
- Is my patient receiving the prescribed medications/doses?
- Are my drugs at appropriate doses?
- Is there an underlying cause I'm not treating?

If medications are not working – ask yourself:

- Are my drugs at appropriate doses?
  - When were levels last checked?
  - New medications or diet??
  - Weight change?
  - Underlying metabolic disease?

If medications are not working – ask yourself:

- Are my drugs at appropriate doses?
  - When were levels last checked?
  - New medications or diet??
  - Weight change?
  - Underlying metabolic disease?
- Is there an underlying cause I'm not treating?
  - Intracranial disease
  - Impaired hepatic or renal metabolism
  - GI malabsorption, metabolic disease
  - UTI

Rescue Plan / "Cluster Buster"

Any animal with a history of cluster seizures needs a rescue plan

Midazolam is only **part of a rescue plan**

When to send home Midazolam?

- History of status epilepticus
- History of cluster seizures in rapid succession (<1 hour between seizures)
- Lifestyle prohibits rapid veterinary access
- Severe / dangerous post-ictal behavior

Rescue Plan / "Cluster Buster"

Midazolam 0.5 mg/kg IN PRN – up to 3 doses in 24 hours

and/or:

- Keppra 30-60 mg/kg PO q8h
- Clorazepate 0.5 mg/kg PO q8h
- Phenobarbital (normal dose) PO q8h

Continue rescue plan until 24 hours seizure free

Continue normal maintenance doses when doing cluster buster protocol

Other Considerations

Supplements and Diets for Epilepsy Patients

- MCT Oil
  - 10% of calories from C8, C10, C12
- CBD
  - May be effective at ~2-9 mg/kg/day
  - Oil suspension most effective
  - Monitor for diarrhea, elevated ALP, ataxia, weight gain

Epilepsy patients still need comprehensive veterinary care

- Preventatives
- Vaccines
- Diet
- Monitor for other comorbidities
- No specific contraindications to general anesthesia

Emergency Seizure Management

Partner Veterinary
EMERGENCY & SPECIALTY CENTER

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CONSENSUS STATEMENT

Journal of Veterinary Internal Medicine Open Access
ACVIM American College of Veterinary Internal Medicine

Consensus Statements of the American College of Veterinary Internal Medicine (ACVIM) provide the veterinary community with up-to-date information on the pathophysiology, diagnosis, and treatment of clinically important animal diseases. The ACVIM Board of Regents oversees selection of relevant topics, identification of panel members with the expertise to draft the statements, and other aspects of assuring the integrity of the process. The statements are derived from evidence-based medicine whenever possible and the panel offers interpretive comments when such evidence is inadequate or contradictory. A draft is prepared by the panel, followed by solicitation of input by the ACVIM membership which may be incorporated into the statement. It is then submitted to the Journal of Veterinary Internal Medicine, where it is edited prior to publication. The authors are solely responsible for the content of the statements.

ACVIM Consensus Statement on the management of status epilepticus and cluster seizures in dogs and cats

Marios Charalambous[1] | Karen Muñana[2] | Edward E. Patterson[3] | Simon R. Platt[4] | Holger A. Volk[1]

Goals for the Seizure Emergency

- Stop the active seizure
- Prevent future seizures
- Identify and treat any potential underlying cause
  - Extracranial disease
  - Structural intracranial disease
  - Known epilepsy patient:
    - "Due" for a seizure?
    - Inadequate medication / time for a change?
    - Something new going on?

Stop the Current Seizure

- Midazolam 0.5 mg/kg IV or IN
  - Recent paper suggests IN is actually more effective and faster than IV
- Keppra 60 mg/kg IV
- Phenobarbital IV if needed
- Other drug options:
  - Dexmedetomidine
  - Ketamine
  - Propofol??

Prevent future seizures

- Midazolam CRI if needed (0.2-0.5 mg/kg/hr IV)
- Pheno 4 mg/kg IV (or PO) q6h x 4 doses, then maintenance dosing
- Keppra 30-60 mg/kg IV or PO q6-8h
- If still having seizures:
  - Are we trending towards better control?
  - Do I need more time for maintenance drugs to work?
    Add a CRI (Dexmed or Ketamine)
  - Do I need higher doses, or a higher frequency?
  - Is there an underyling cause we're not treating?

Take Home Points

- Make sure the episode is a seizure
- Know when to start meds and what your goals are
- Start with first line AEDs
- Max out one drug before starting another
- Manage clusters and status epilepticus as needed

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Thank you!
Questions?

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