EPILEPSY & SEIZURES

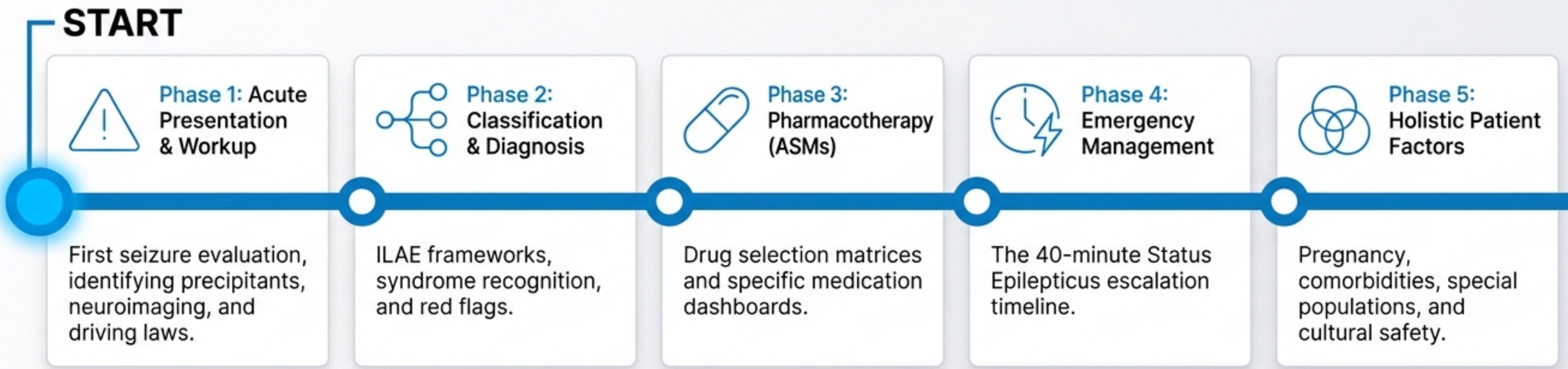
The Clinical Cognitive Aid: Diagnosis, Pharmacotherapy, and Emergency Workflows

Austroads 2022 Aligned

ILAE 2017 Classification

Med2Date 2026 Guidelines

The Clinical Workflow



Step 1: Evaluating the First Seizure Presentation

Provoked (Acute Symptomatic)	Unprovoked
Timing: Within 7 days of acute insult.	**Timing:** No acute precipitant.
Causes: Hypoglycaemia, hyponatraemia, alcohol withdrawal, stroke.	**Causes:** Genetic, structural, cryptogenic.
Recurrence Risk: Low (<10%) if corrected.	**Recurrence Risk:** 40–50% at 2 years.
Driving: Minimum 4 weeks.	**Driving:** Minimum 6 months.

Metabolic Red Flag Panel - Mandatory Exclusions

Blood glucose (<3.0 mmol/L) | Sodium (<120 mmol/L) | Calcium | Magnesium | Renal/Hepatic function | Toxicology

Step 2: Acute Neuroimaging & MRI Protocols

CT Head (Non-Contrast)

When: Acutely in ED (Available 24/7, MBS Item 56001).

Indications: Focal neurological signs, persistent altered consciousness, anticoagulation, suspected structural lesion/haemorrhage.

Limitation: Poor sensitivity for cortical dysplasia or hippocampal sclerosis.

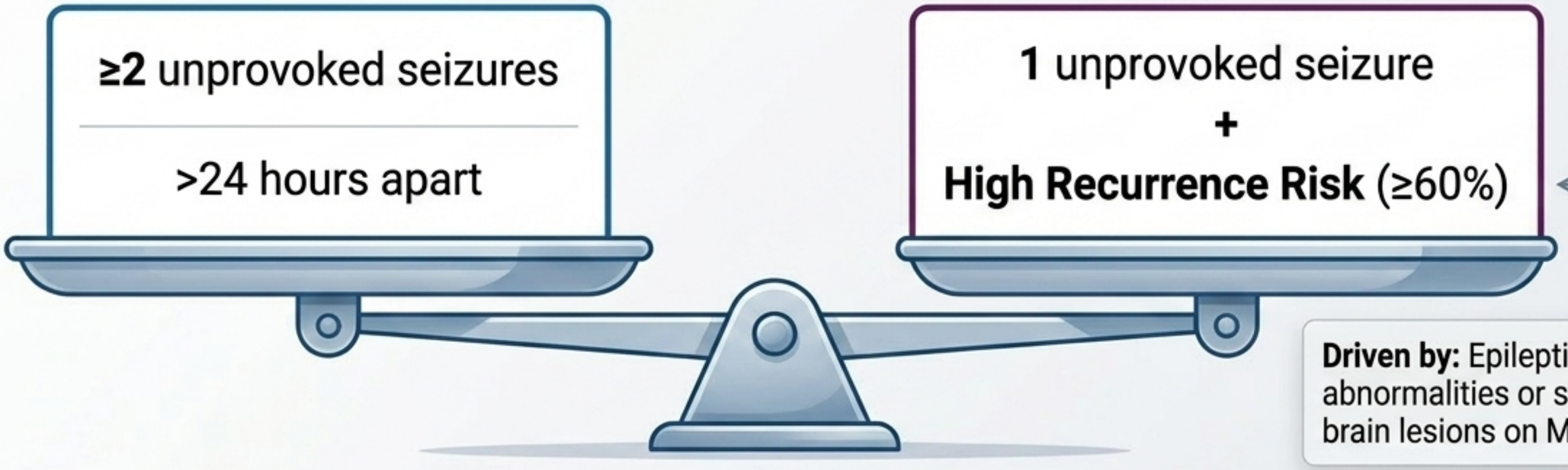
MRI Brain (Epilepsy Protocol)

When: First-line for ALL unprovoked seizures (MBS Item 63060/63063).

Protocol Detail: Must include thin coronal T2/FLAIR sequences through the temporal lobes and hippocampi.

Logistics: Requires neurology/neurosurgery referral; potential 4–8 week wait in regional Australia. Paediatrics may require general anaesthesia.

Step 3: EEG Timing & The Diagnostic Threshold



EEG Logistics & Timing

Perform within 24–48 hours to maximize sensitivity (~50–70%).

Routine EEG: 20–30 mins (`MBS Item 11005`).

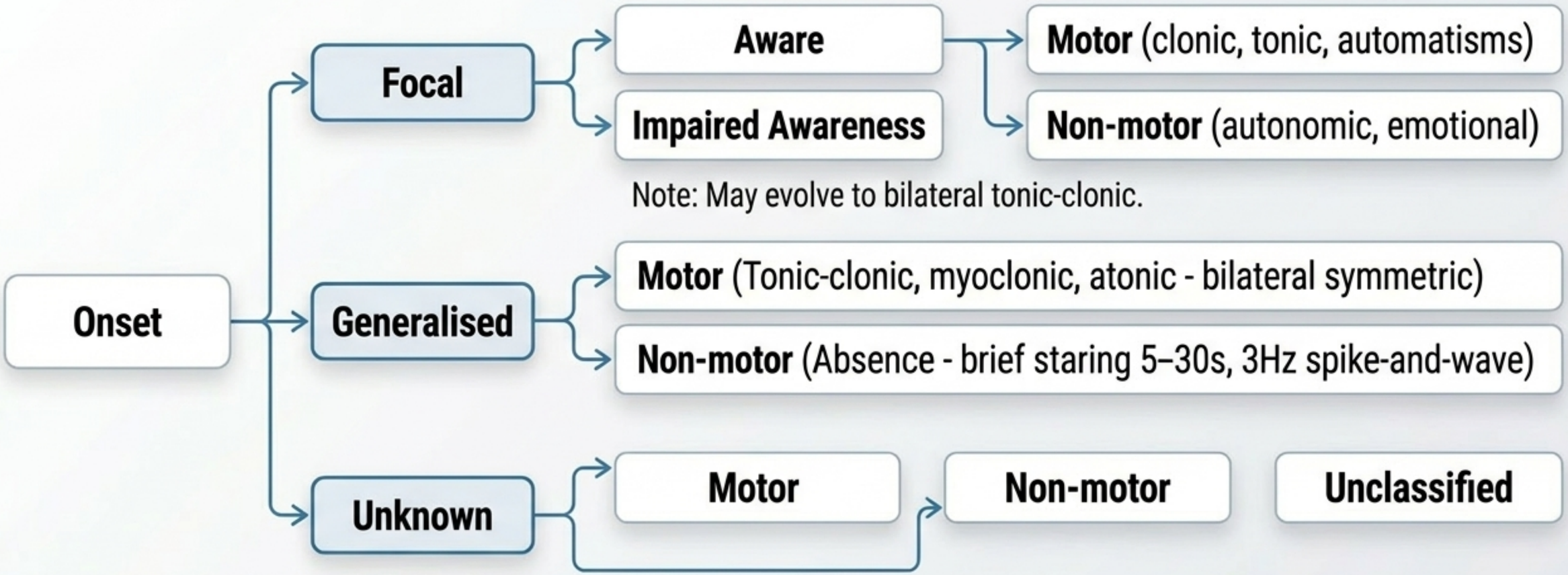
Sleep-Deprived EEG: 3–4 hours sleep prior; improves yield if routine is normal.

Step 4: Austroads 2022 Driving Restrictions & Mandatory Notification

Mandatory Notification: Doctors have a legal obligation to notify the relevant driver licensing authority (e.g., VicRoads, Transport NSW) when a patient experiences a seizure. Patients must be counselled not to drive.

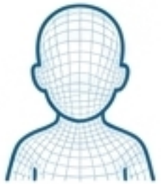
Seizure Type	Private License	Commercial License
Single Provoked:	Min 4 weeks	Min 6 months
Single Unprovoked:	Min 6 months	Min 12 months + specialist review
Established Epilepsy (≥2 unprovoked):	Min 12 months seizure-free	Generally disqualifying
Sleep-Only Seizures:	3 years exclusively nocturnal	Disqualifying

The Seizure Classification Tree (ILAE 2017)



Clinical Clue: Focal aware seizures (auras) maintain consciousness and may be mistaken for anxiety or migraines.

Recognizing Common Epilepsy Syndromes



The 6-Year-Old

(Childhood Absence)

Multiple daily 5-30s staring spells.
Normal cognition.
EEG: 3 Hz spike-and-wave.

First-line: Ethosuximide or Valproate.

Prognosis: 60-70% remit by adolescence.

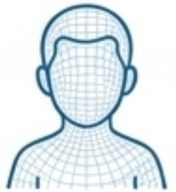
The 15-Year-Old

(Juvenile Myoclonic - JME)

Morning myoclonic jerks, generalised tonic-clonic, photosensitivity.

First-line: Valproate (males) / Levetiracetam (females).

Prognosis: Lifelong ASM needed; >90% controlled.



The 8-Year-Old

(BECTS / Rolandic)

Nocturnal hemifacial/oropharyngeal focal seizures.
Centrotemporal spikes.

First-line: Often none needed, or Carbamazepine.

Prognosis: Remits by age 15.

The Young Adult

(Temporal Lobe - TLE)

Focal impaired awareness, automatisms, epigastric rising aura.
MRI: Hippocampal sclerosis.

First-line: Carbamazepine, Lamotrigine.

Prognosis: 60-70% responsive; surgical candidate if refractory.

Secondary Causes & Specialist Referral Triggers

New **focal neurological deficit**

Progressive **headache** / **Papilloedema**

Fever with **neck stiffness** (Meningitis/Encephalitis)

History of **malignancy** (Metastases)

Immunosuppression (Abscess, PML, CNS lymphoma)

'Thunderclap' headache (SAH) or new onset age >40.

Neurology Referral Checklist
(MBS Item 104/99)

- ☑ All new diagnoses
- ☑ Suspected PNES (accounts for 20-30% of clinic referrals)
- ☑ Women of childbearing age
- ☑ Refractory Epilepsy (defined as failure of ≥2 appropriate, adequately dosed ASMs)

The Master ASM Selection Grid

Seizure Type	First-Line	Second-Line	AVOID
Focal:	Levetiracetam, Carbamazepine, Lamotrigine	Clobazam, Topiramate	Valproate in childbearing women
Generalised Tonic-Clonic:	Valproate, Levetiracetam	Lamotrigine, Topiramate	Carbamazepine, Phenytoin - may worsen
Absence:	Ethosuximide, Valproate	Lamotrigine	Carbamazepine, Phenytoin, Gabapentin
Myoclonic (JME):	Valproate for males, Levetiracetam	Clobazam	Carbamazepine, Phenytoin, Pregabalin - exacerbates myoclonus

Key Principle: Start low, go slow. Monotherapy to lowest effective dose. Never abruptly cease ASMs.

Broad-Spectrum Monotherapy Profiles

💊 Levetiracetam (Keppra®)

Broadest first-line spectrum.

Dose:
Start 250 mg PO BD → Target 500-1500 mg BD.

Metabolism:
Minimal hepatic metabolism.
NO CYP450 interactions (Major advantage).
Renal adjustment required (eGFR <80).

Adverse:
Behavioural/psychiatric (irritability, aggression 5-15%), somnolence.

💊 Lamotrigine (Lamictal®)

Preferred in pregnancy.

Dose:
SLOW titration mandatory. Start 25 mg PO OD for 2 weeks → target 100-200 mg BD.

Adverse:
🚨 Serious rash (SJS/TEN) risk highest with rapid titration or valproate co-administration.

Pregnancy: Lowest teratogenic risk. Clearance increases 50-100% by 3rd trimester (requires dose increase).

Targeted Monotherapy Profiles

💊 Carbamazepine (Tegretol®)

Sodium channel blocker for Focal seizures.

Dose:
Start 100 mg PO BD with food → Target 200-800 mg BD.

Interactions:
Potent CYP3A4 inducer. Massively interacts with oral contraceptives and DOACs.

Pharmacogenomics: 🚨
HLA-B*1502 testing recommended before initiation in SE Asian/Indian ancestry (SJS risk).

Adverse:
Diplopia, ataxia, hyponatraemia (SIADH).

💊 Ethosuximide (Zarontin®)

Strictly for Absence seizures.

Dose:
Start 500 mg PO OD → Target 750-1500 mg/day.

Adverse:
GI upset, drowsiness.

Note: Equal efficacy to valproate for absence but fewer adverse effects.

Sodium Valproate & The Teratogenicity Danger Zone

🔗 💊 Sodium Valproate (Epilim®)

Broadest efficacy, highest danger.

Dose: Target trough 50-100 mg/L.

Adverse: Weight gain, tremor, hair loss, rare hepatotoxicity. Avoid in severe hepatic impairment.

The Teratogenicity Danger Zone

5–10% Risk of Major Congenital Malformations (Neural tube defects, cardiac).

30–40% Risk of Neurodevelopmental Disorders (Autism spectrum, 7-10 point IQ reduction).

Mandatory Protocol: TGA Pregnancy Prevention Programme: Women of childbearing potential MUST be enrolled. Requires annual review, documented pregnancy tests, and highly effective contraception.

Emergency Management: Pre-Hospital & Early ED (0–5 Min)

0 MIN

Seizure Begins

First Aid Checkmarks:

✔️ Position on side. ✔️ Protect head. ✔️ Time the seizure.

❌ Do NOT restrain. ❌ Do NOT insert anything in mouth.

5 MIN

First-Line Benzodiazepines (Pre-Hospital)

If no IV access:

💉 **Midazolam 10 mg IM** (preferred pre-hospital)

OR **Diazepam 10–20 mg PR.** 🩹

5 MIN

ED Arrival & Initial Assessment

🩺 **ABCs**, establish IV access, continuous pulse oximetry.

🚨 **Check BGL Immediately:**

If **<3.0 mmol/L**, give **50 mL of 50% glucose (25 g)** IV bolus.

Give **Thiamine 100 mg** IV first if alcohol misuse suspected.

Status Epilepticus Escalation Timeline

Convulsive Status Epilepticus: ≥5 mins of continuous seizure OR ≥2 discrete seizures without recovery. 15-20% adult mortality if untreated >30 mins.

05 MIN

IV Benzodiazepines

Diazepam 10 mg IV (over 2-3 mins, repeat once at 5 min)

OR

Lorazepam 4 mg IV.

20 MIN

Second-Line ASMs

Seizure persists.

Give **ONE:**

IV Levetiracetam 60 mg/kg (max 4500 mg, safest profile)

OR

IV Sodium Valproate 40 mg/kg (max 3000 mg, avoid in women)

OR

IV Fosphenytoin 20 mg PE/kg (needs cardiac monitoring).

40 MIN

Refractory Status (ICU)

Rapid Sequence Intubation (RSI) + continuous EEG.

Continuous IV infusion: Midazolam, Propofol, or Thiopentone.

Contraception & ASM Interaction Matrix

A

Enzyme-Inducing ASMs

(Carbamazepine, Phenytoin, Topiramate >200mg, Oxcarbazepine).

Effect:
Reduces efficacy of combined pill (COC), progestogen-only pill, implants, and depot.

Action:
Use Levonorgestrel IUD (Mirena®) or Copper IUD. If using COC, requires ≥50 µg ethinyloestradiol with continuous use.

B

Non-Inducing ASMs

(Levetiracetam, Valproate, Ethosuximide)

Effect:
No significant interaction. Standard contraceptive options apply.

Standard contraceptive options apply.

C

The Lamotrigine Exception

(Bidirectional interaction)

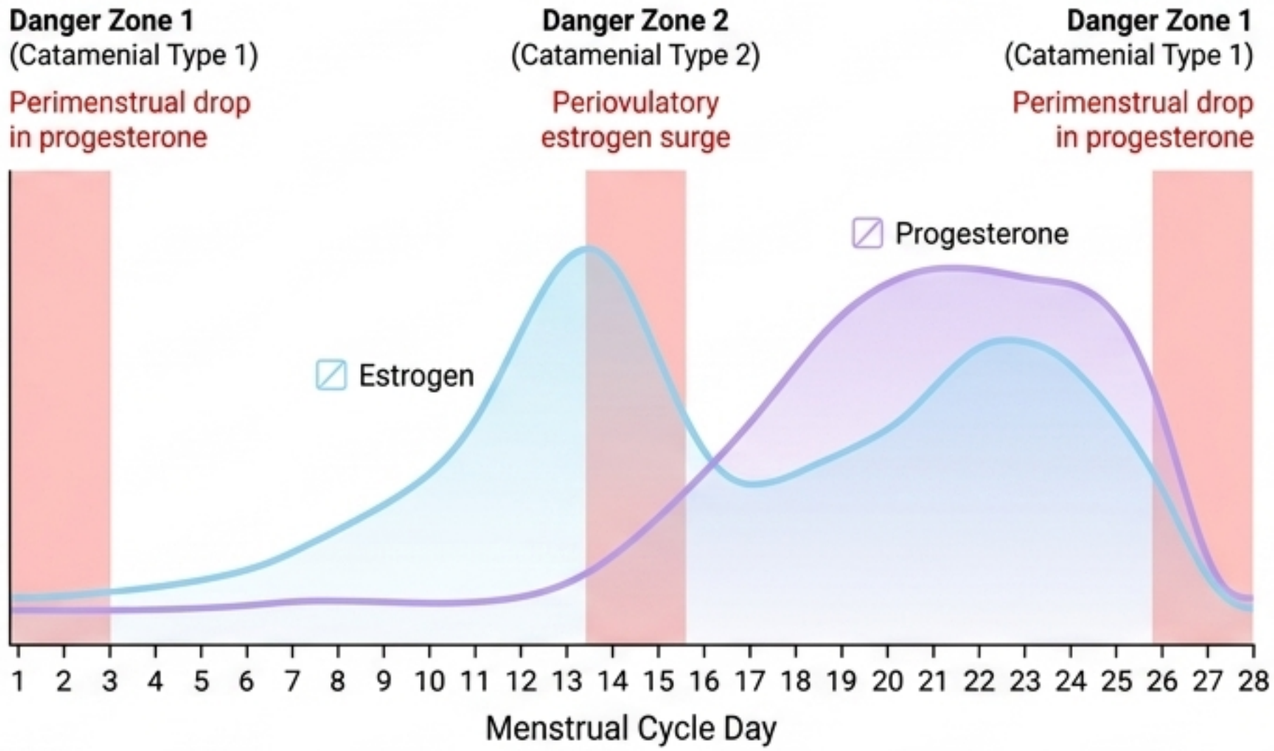
Effect:
COC reduces Lamotrigine levels by ~50% **(risk of breakthrough seizures).** Monitor levels closely.

Pregnancy Planning & The Catamenial Cycle

Pre-Conception Checklist

- [x] Folic acid **5 mg** daily (high dose) started **≥1 month** before conception. Standard **0.5 mg** is inadequate.
- [x] Switch away from Valproate **≥3 months** prior.
- [x] Establish baseline ASM levels (especially Lamotrigine/Levetiracetam, which require **50-100%** dose increases by 3rd trimester).

The Catamenial Cycle Overlay



Intervention: `Clobazam 10-20mg` luteal-phase rescue or hormonal IUD.

Considerations for Special Populations

Paediatrics

Simple febrile seizures (<15 min) need no ASM.

Suspect Dravet Syndrome (*SCN1A*) if prolonged infant seizures → strictly **AVOID** sodium channel blockers (Carbamazepine, Lamotrigine) as they exacerbate seizures.

The Elderly (≥65 yrs)

Highest incidence demographic. Presentations often subtle (confusion, falls).

AVOID Phenytoin/Phenobarbitone (falls/cognitive impairment) and Carbamazepine (hyponatraemia).

Preferred: Levetiracetam/Lamotrigine

Assess bone health (DEXA) if on enzyme inducers.

Immunocompromised

HIV/Chemo/Transplant.

High suspicion for CNS infections/lymphoma.

Preferred ASM: Levetiracetam or Lacosamide (no interaction with tacrolimus/ARVs).

Avoid enzyme inducers which cause transplant rejection.

Pharmacokinetic Adjustments: Renal & Hepatic Impairment

Renal Impairment

Levetiracetam

⚠️ Requires strict dose reduction.

`eGFR 50–80 (Max 1000mg BD); eGFR <30 (250–500mg BD). Add supplemental dose post-dialysis.`

Gabapentin/Pregabalin

⚠️ Significant dose reduction required by eGFR.

Valproate/Lamotrigine/Carbamazepine

🟢 No dose adjustment generally required.

Hepatic Impairment

Valproate

🚨 CONTRAINDICATED in severe hepatic impairment.

`Monitor LFTs at 1, 3, 6, and 12 months.`

Carbamazepine/Phenytoin/Lamotrigine

⚠️ Metabolized hepatically; use with extreme caution, reduce doses, monitor free drug levels.

Levetiracetam

🔵 Preferred choice (minimal hepatic metabolism).

Aboriginal & Torres Strait Islander Epilepsy Care

Epidemiology Bar Chart/Stat

Prevalence is 1.5–2x higher, with disproportionately elevated status epilepticus and mortality rates, often linked to TBI and CNS infections.

Care Integration Model

Access & Telehealth

Utilize MBS Item 99 (Telehealth) to overcome remote geographic isolation.

Integrate Aboriginal Health Workers into the care team.

Medication Supply

Remote pharmacies lack stock (e.g., Levetiracetam liquid).

Utilize RAAHS Section 100.

Pharmacogenomics

Higher prevalence of HLA-B^{s}1502 in some communities.

Test before initiating Carbamazepine.

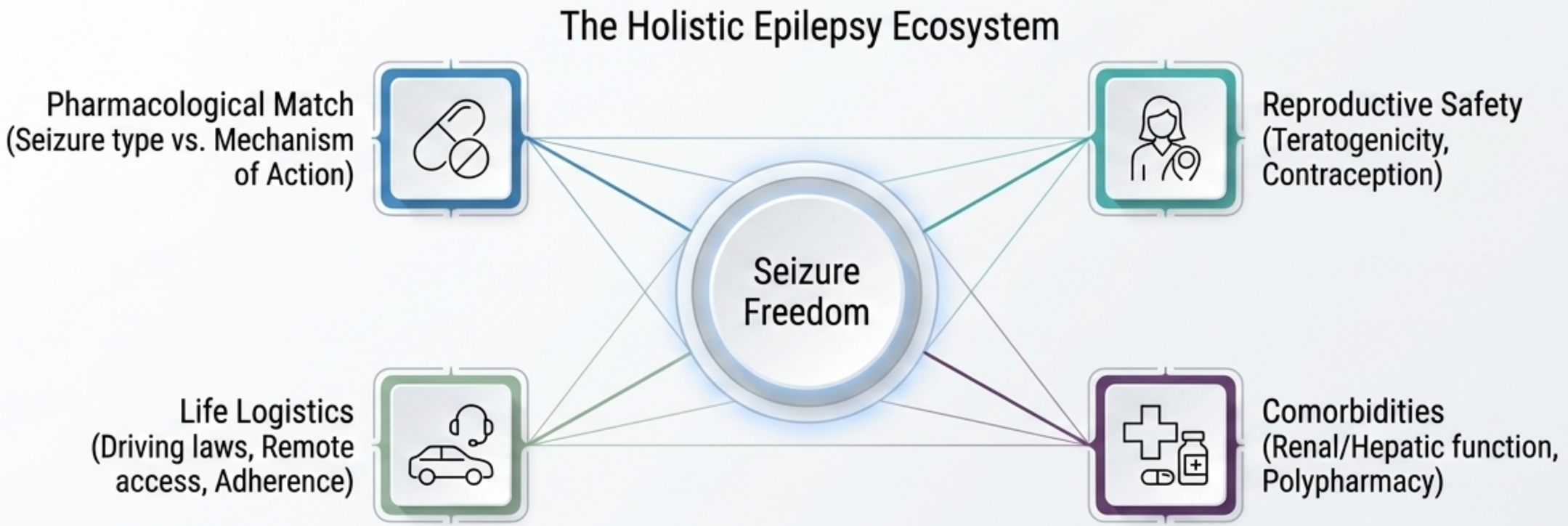
Cultural Safety

Integrate Western medicine with culturally respectful explanations.

Be flexible around 'Sorry Business' for medication supply.

Provide practical transport liaison due to severe impact of driving restrictions in remote areas.

Synthesis: Treating the Patient, Not Just the Seizure



Insight Callout

Optimal care is a delicate balancing act. A structurally perfect drug for a seizure (e.g., Valproate for JME) can be a catastrophic choice for the patient's demographic (a woman of childbearing age). Mastery requires synthesizing all variables simultaneously.