

Differences in Adult Seizure Treatment

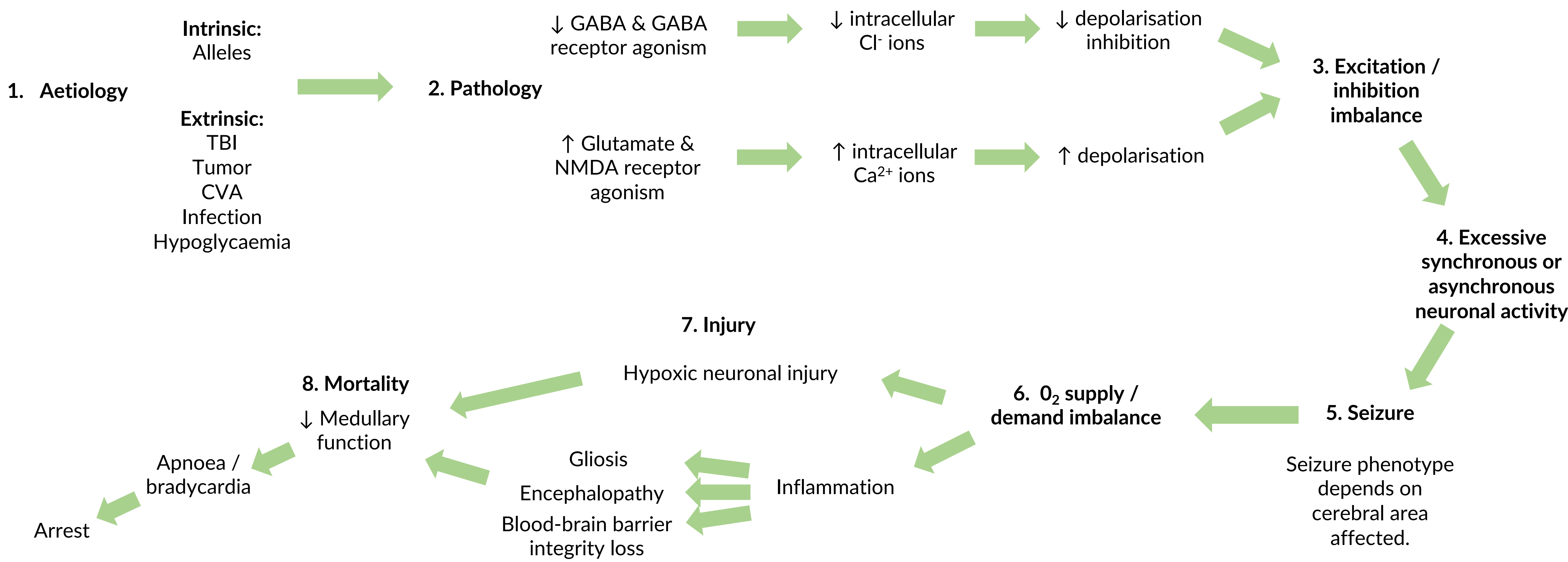
Method

Produced July 2022. This poster is a descriptive analysis and comparison of a specific and discrete cluster of primary sources. All of the ten jurisdictional services have open access Clinical Practice Guidelines (CPGs). Content was extracted by three paramedics, with oversight from two senior lecturers in paramedicine. Scope of practice was classified as ‘Paramedic’ (undergraduate degree, represented by a ✓), ‘Intensive Care Paramedic’ (intensive care postgraduate degree), ‘Extended Care Paramedic’ (primary care postgraduate degree), or ‘Specialist’ (all other advanced roles, e.g. Retrievalist). Routine cares were omitted for brevity. This comparison does not review the peer-reviewed, published literature to determine current best practice in treatment. Consequently, no CPG is inferred to be superior or inferior to any other, nor that the most common treatment is necessarily optimal. This resources is created purely to assist making paramedics aware of current Australasian treatment options across JASs.

Jurisdiction (Service)	Pharmacology					Intervention			
	Benzodiazepine			Electrolyte	Anticonvulsant				
	Midazolam (intramuscular)	Midazolam (intranasal)	Midazolam (intravenous)	Magnesium Sulphate (intravenous)	Valproate (intravenous)	Levetiracetam (infusion)	Phlebotomy	RSI / DSI	
Aus. Capital Territory (ACTAS)	✓	(a)	ICP	✓ (b)				ICP	
New South Wales (NSWA)	✓		✓						
New Zealand (SJNZ)	✓		✓	ICP (b, c)				✓	
New Zealand (WFA)	✓		✓	ICP (b, c)				✓	
Northern Territory (SJNT)	✓		✓	ICP (b)					ICP
Queensland (QAS)	✓	✓	✓	ICP (b)		ICP		Specialist (d)	
South Australia (SAAS)	✓		ICP			ICP		Specialist (e, f)	
Tasmania (AT)	✓		ICP	ICP (b)					
Victoria (AV)	✓		ICP						
Western Australia (SJWA)	✓		✓						✓

(a) Not carried, but authorised to administer patient’s own medication via this route if available (b) Indicated for eclampsia only (c) Consultation required (d) ICP – “High Acuity Response Unit” only (e) ICP – “Retrievalist Flight Paramedic: only (f) Medical consultation required

Pathology flowchart



Treatment rationale

Midazolam

- Benzodiazepine that binds to an allosteric site on GABA_A receptors, increasing the conductance of chloride anions when the ligand binds to the active site.
- The increase in intracellular negative ions hyperpolarises the cell, leading to action potential inhibition and termination of excessive neuronal activity.
- GABA_A receptors are increasingly internalised within the neuron with ongoing seizure duration, and delay in administration of benzodiazepines may ultimately lead to reduced efficacy.

Magnesium Sulphate

- The second-most populous cation in the intracellular space – increasing extracellular magnesium raises the negative membrane potential, leading to action potential inhibition.
- Magnesium has multiple uses in pre-hospital medicine, including as an antidysrhythmic, anticonvulsant (especially prophylactically in pre-eclampsia), bronchodilator, vasodilator, and is under investigation for use in headache.

Valproate

- Mechanism of action includes increasing cerebral GABA concentrations (inhibiting action potentials) and blockading voltage-gated sodium-potassium channels (decreasing depolarisation likelihood).

Levetiracetam

- Mechanism of action is unknown – it does not blockade channels in the same manner that valproate does, and any GABA effects are believed to be mild – however, it has been shown to bind to SV2A, a protein in the axon terminal that facilitates calcium-induced exocytosis of neurotransmitters.
- Inhibition of calcium may underly the anticonvulsant properties it has.
- A recent, large-scale systematic review and meta-analysis found that levetiracetam had similar efficacy, lower adverse effects, and better cost-effectiveness than valproate, lorazepam, and phenytoin for status epilepticus.