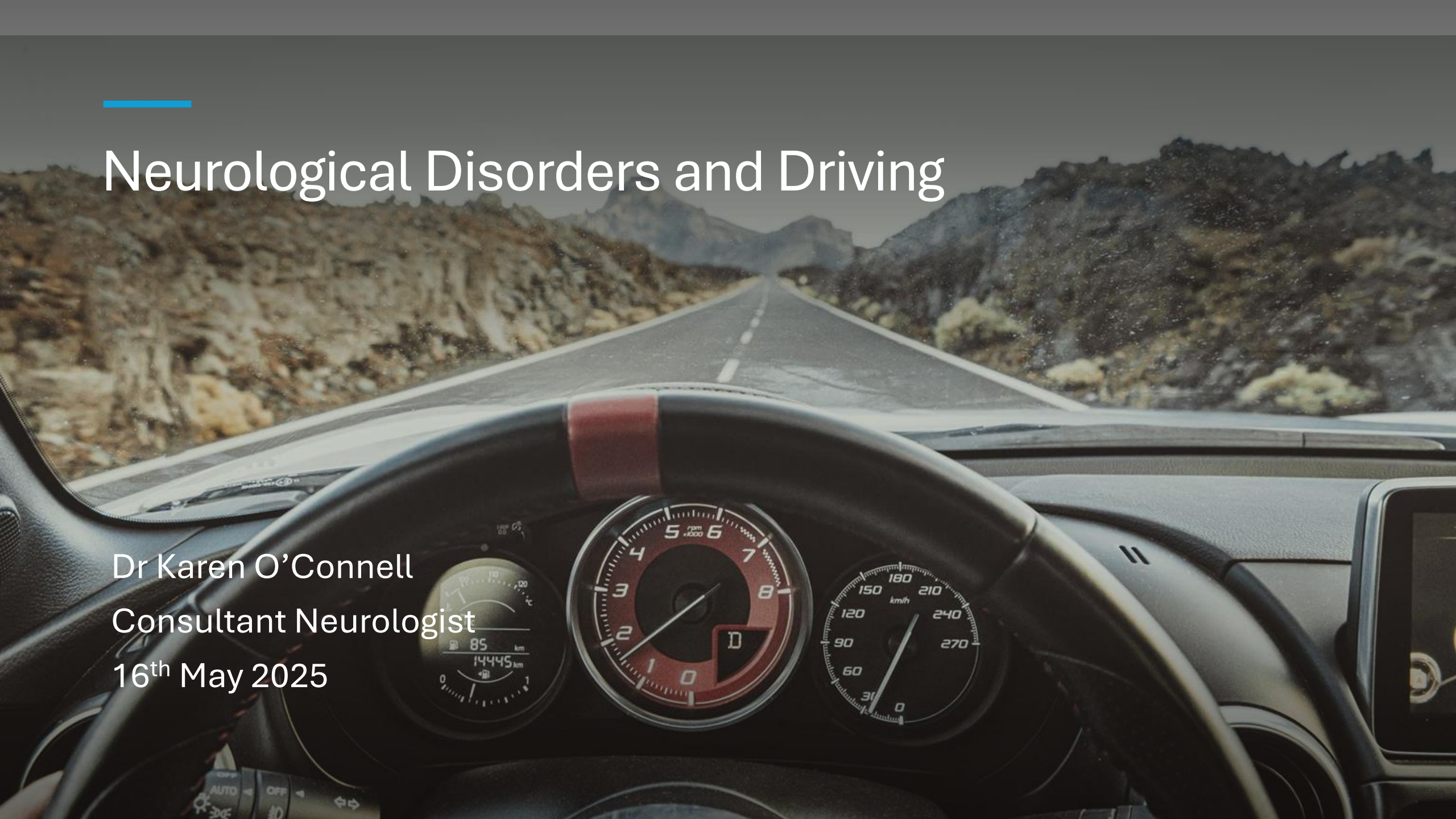
Neurological Disorders and Driving



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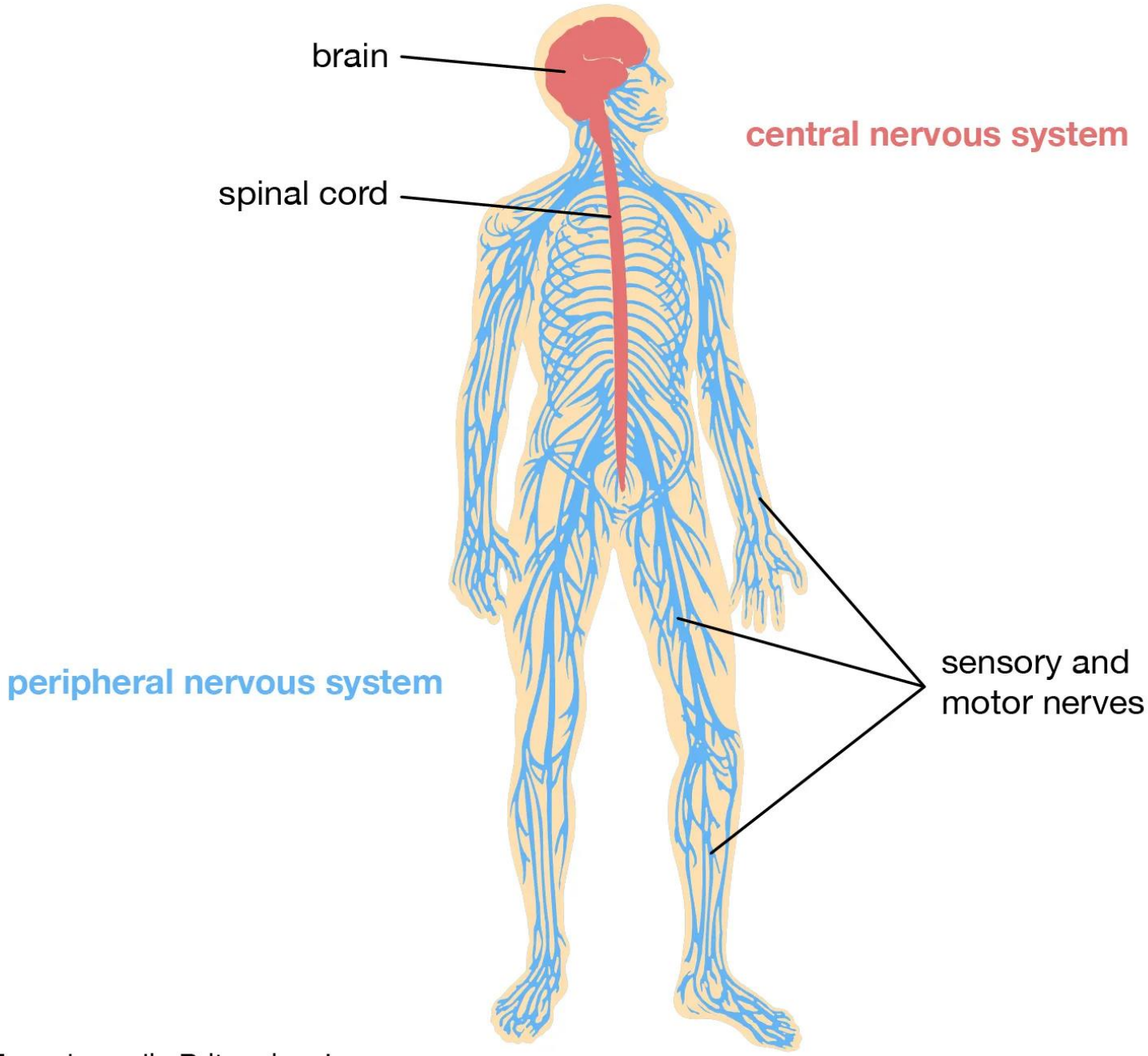
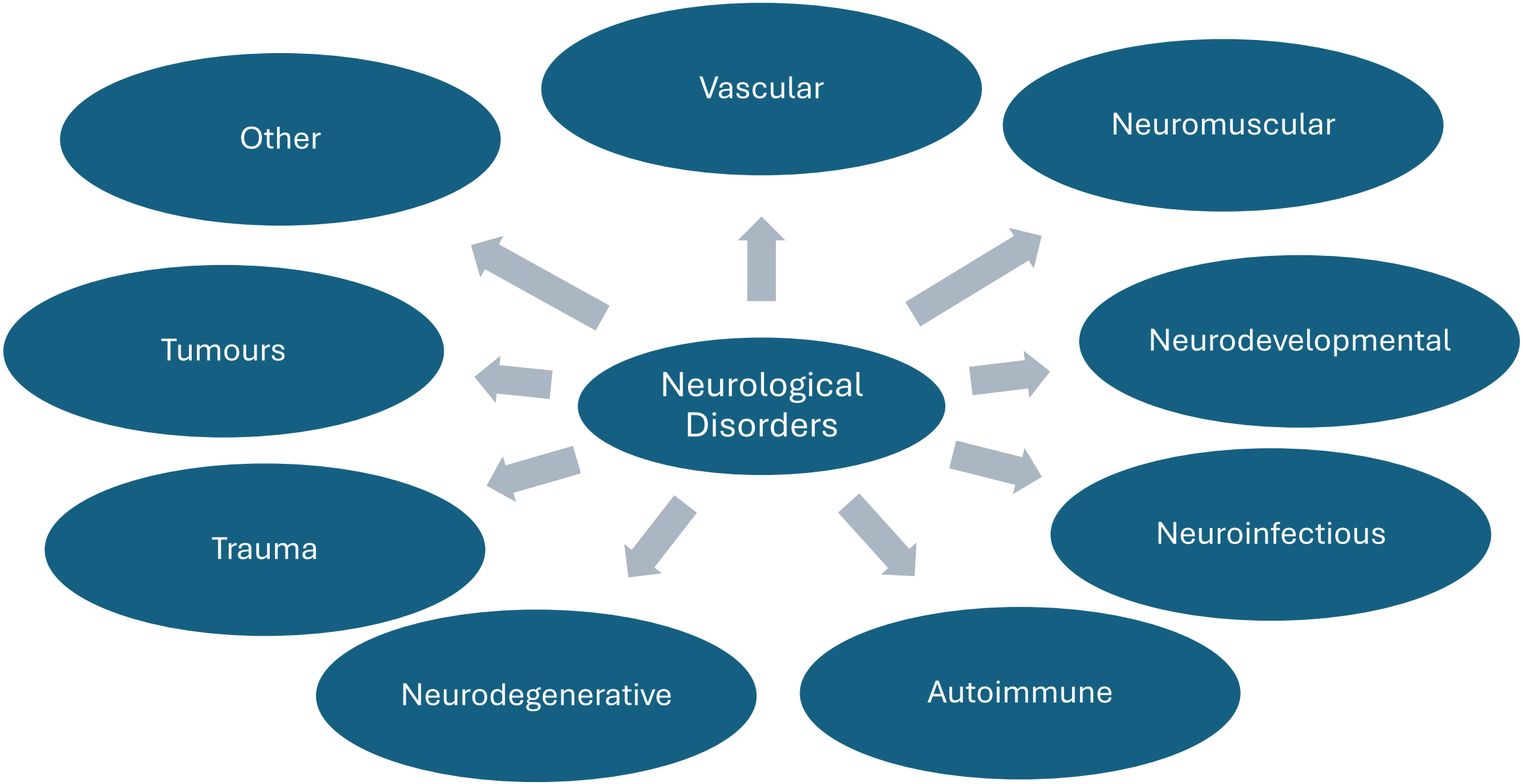
16th May 2025

The nervous system




Vascular
Other
Neuromuscular
Tumours
Neurodevelopmental
Neurological Disorders
Trauma
Neuroinfectious
Neurodegenerative
Autoimmune

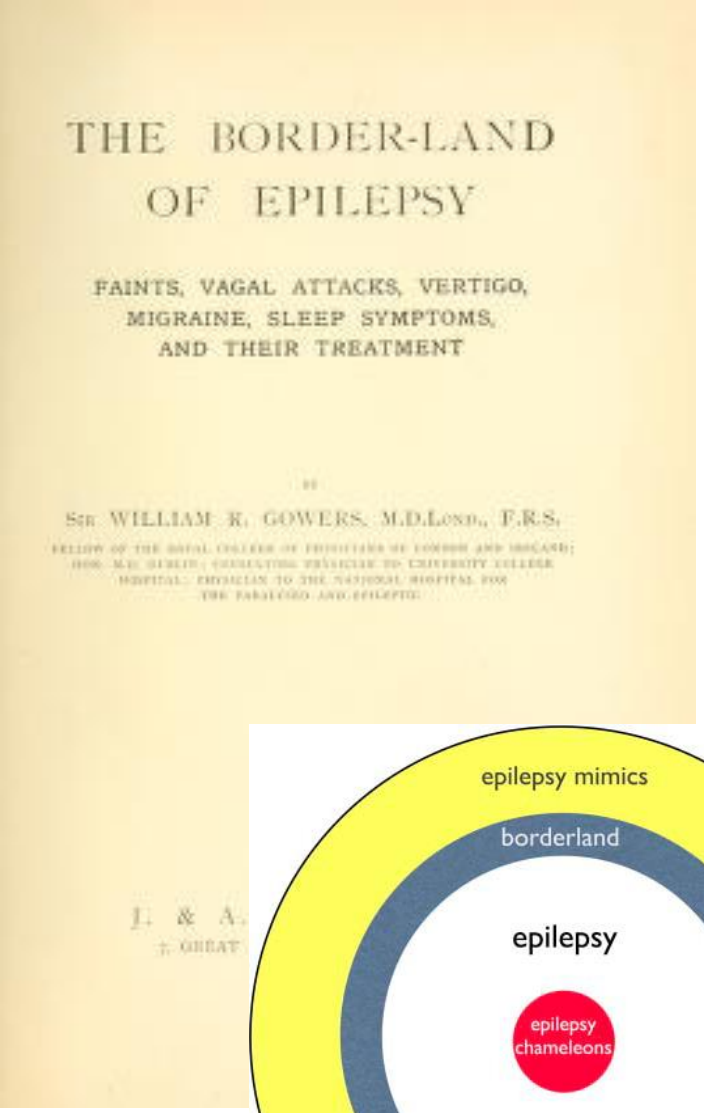
Impact on driving

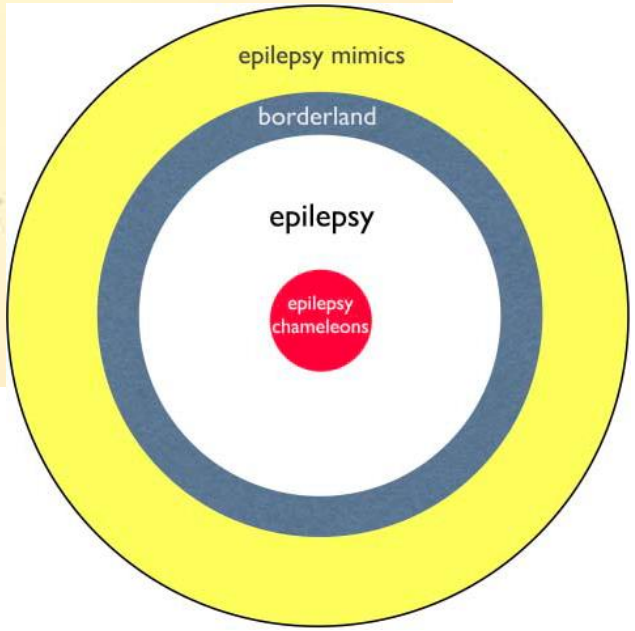
- Disorders of consciousness
- Cognition
- Physical functioning

- Psychological

General principles

- Goal is to enable people to drive if safe to do so
- Acknowledging that certain disorders can progress over time and will need reassessment





Fits, faints and funny turns

- Can sometimes be challenging
- Diagnostic implications
- Driving implications

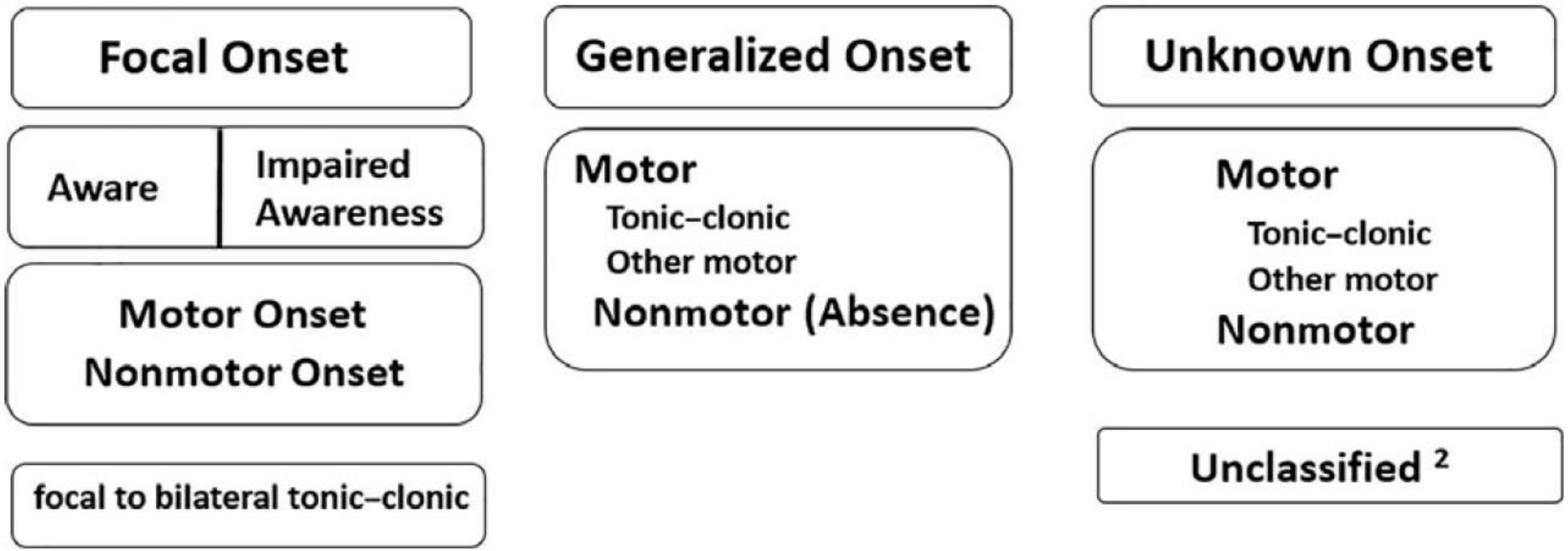
- Epilepsy is largely a clinical diagnosis and defined by two or more unprovoked seizures that occur more than 24 hours apart

- Estimated that 3-4% of population with have an unprovoked seizure in their lifetime and approximately half will develop epilepsy

- Increased risk associated with:
  - Epileptiform abnormalities on EEG
  - Remote symptomatic cause, as identified by clinical history or neuroimaging
  - Abnormal neurologic examination, including focal findings and intellectual disability
  - A first seizure that occurs during sleep

- EEG – rate of finding an epileptiform abnormality on first EEG in new onset unprovoked seizure or incident epilepsy ranges from:
  - 32% to 59% in children
  - 12% to 44% in adults

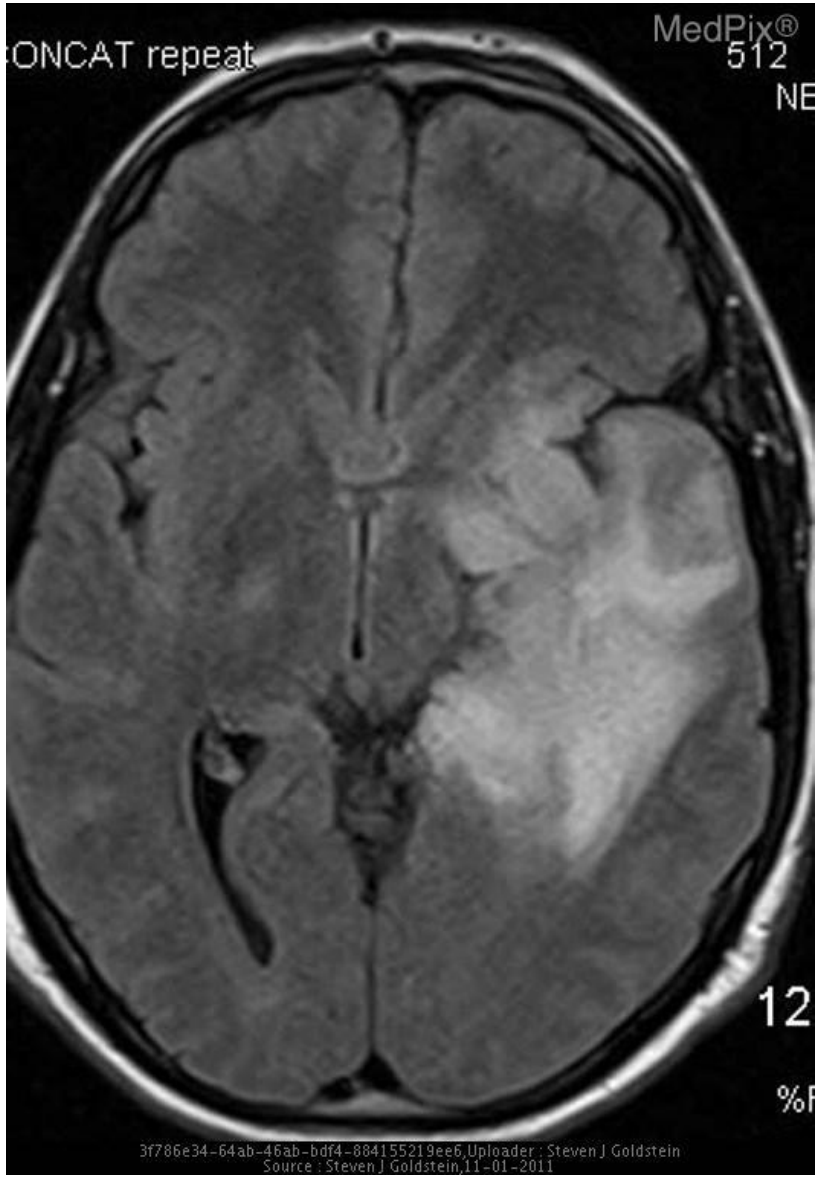
ILAE 2017 Classification of Seizure Types Basic Version [1]



66 year old woman

- **Referral:** Recurrent episodes of speech arrest, staring, lasts 1-2 mins. May be confused after. On two occasions noted to be moving her lips and her right arm lifted in the air. ?complex partial seizures

- Reviewed the patient and she described a funny sensation prior to the events, hard to verbalise. She had no recollection of the actual event. Thought perhaps she had become more forgetful in recent times.



Seizures and Driving – Balancing Risk

- Risk of motor vehicle accident (MVA) which can lead to injury to self and other and property damage
- Limitations on engagement in education and social activities leading to reduced quality of life

Seizures and risk of MVA

- Known increase in MVAs in people with epilepsy (modest)
- Higher in those with ongoing seizures
- Risk of fatal MVAs not higher than the background population (less than alcohol, young age and distraction)
- Increasing duration of ‘seizure-freedom’ is associated with a lower risk of further seizures and MVAs in people with epilepsy

Duration of seizure-freedom	Motor vehicle accident, OR (95% CI)
≥ 3 mo	0.428 (0.15–1.4)
≥ 6 mo	0.147 (0.031–0.691)
≥ 12 mo	0.075 (0.012–0.47)

Abbreviation: OR = odds ratio.

Our guidelines work off the principle that the seizure risk is:

<20% per annum for Group 1 drivers

<2% per annum for Group 2 drivers

Approach to assessing seizure risk and driving

- Need to establish seizure type and duration
  - Emphasis on impaired consciousness
- Underlying structural cause or abnormal EEG
- Seizure frequency and period of seizure freedom
- Compliance with medication and hospital attendance
- Lifestyle

Rates of 1-year seizure freedom with successive anti-epilepsy drug regimens

Regimen	Number of people attempting regimen	Of those who attempted, number achieving seizure freedom	Seizure freedom rate	Number eligible to try next regimen*
First	1,795	820	45.7%	975
Second	742	208	28.0%	534
Third	330	78	23.6%	252
Fourth	140	21	15.0%	119
Fifth	71	10	14.1%	61
Sixth	43	6	14.0%	37
Seventh	15	1	6.7%	14
Eighth	9	0	0%	9
Ninth	5	0	0%	5
Tenth	2	0	0%	2
Eleventh	1	0	0%	1

* This group includes all patients not achieving 1-year seizure freedom, including those who stopped taking medication due to adverse effects, pregnancy, or other concerns. Not all eligible patients go on to try subsequent regimens.

Data from Chen Z, Brodie MJ, Liew D, Kwan P. Treatment outcomes in patients with newly diagnosed epilepsy treated with established and new antiepileptic drugs: a 30-year longitudinal cohort study. *JAMA Neurol.* 2018;75(3):279-286. doi:10.1001/jamaneurol.2017.3949

Recurrent seizure risk, after a first unprovoked seizure:

- 1 in 4 (25%) adults would have had a second seizure in the first 6 months
- 1 in 3 (35%) would have had a second seizure in the first year
- 2 in 5 (41%) would have had a second seizure in the first 2 years

Current guidelines – epilepsy standards

Group 1

- Not permitted to drive until 1 year seizure free
- Reviewed annually for 5 years and 1 year license issued

Group 2

- Not permitted to drive until off medication and 10 years seizure free
- Compliant with medical follow up
- Normal EEG and imaging studies

Current guidelines – 1st unprovoked seizure

- Group 1
  - If not considered high risk – advised not to drive for 6 months
  - If following assessment by a neurologist, clinical or investigation results (ie abnormal EEG, structural brain lesion) would confer a seizure risk of >20% per annum, then epilepsy standards apply.

- Group 2
  - If not considered high risk – advised not to drive for 5 years*
  - If following assessment by a neurologist, clinical or investigation results (ie abnormal EEG, structural brain lesion) would confer a seizure risk of >2% per annum, then epilepsy standards apply.

Current guidelines – Psychogenic Non-Epileptic Seizures (PNES)

- Group 1
  - If co-morbid epilepsy, epilepsy standards should be applied unless following assessment by a neurologist, the events are felt to be PNES and has had no seizures for >12 months
  - Not to drive for 3 months if fulfill any of the below:

    1. Loss of awareness/responsiveness with their psychogenic Seizures.

    2. History of PNES-related injuries.

    3. No auras or warnings or otherwise predictable psychogenic seizures.

    4. If PNES semiology suggests that ability to drive would be impaired during a psychogenic seizure.

- Group 2
  - If co-morbid epilepsy, epilepsy standards should be applied unless following assessment by a neurologist, the events are felt to be PNES and has had no seizures for >10 years of all medication
  - If fulfill above, need to be 3 months event free

Current guidelines – neurosurgical conditions

Group 1

- Epilepsy standards apply
- An exception may be considered if seizure occurred at the time of the head injury or surgery

Group 2

- Epilepsy standards apply
- An exception may be considered if seizure occurred at the time of the head injury or surgery and the seizure risk is deemed to be <2% per annum

Exceptions and considerations

Provoked seizures:

- Seizures that occur due to provoking factors that are unlikely to recur in the future or not due to a unmasking of an underlying liability
  - Systemic infection with high fever
- These do not include fatigue, sleep deprivation, alcohol or drug misuse or stress
- These are individually assessed by the treating neurologist for both group 1 and 2 drivers

Exceptions and considerations

Seizures not impairing consciousness or ability to drive (only applies to group 1):

- May drive but pattern must be established for >12 months with no other seizure type over this period
- Compliant with medication if prescribed

Exceptions and considerations

Nocturnal seizures

- Group 1:
  - May be permitted to drive if no history of awake seizures or last awake seizure is >1 year ago
  - First nocturnal event was >12 months ago and this pattern is established
  - Compliant with ASM and assessment

- Group 2
  - Not permitted to drive unless meets epilepsy standards

Exceptions and considerations

Medication withdrawal:

- Group 1:
  - When weaning medication to stop, should be advised not to drive while medication being reduced and for 3 months after. This may be extended by the neurologist if there is a compelling reason to do so
- Group 2:
  - Not permitted to drive unless meets epilepsy standards

17 year old girl

- Referral letter:
  - Was out shopping with mother and suddenly collapsed to the ground, jerking of arms and legs. ?seizure

- Reviewed patient:
  - Described feeling very warm prior to the event, her vision blurred and that is her last memory. Her next memory was coming to on the floor of the shop. She knew where she was within a couple seconds. She had no tongue-biting or incontinence.

  - No previous episodes of loss of consciousness but would feel lightheaded if standing in crowded rooms etc.

  - Limb-jerking? **Need collateral**

Syncope – ‘faint’

- Reflex vasovagal syncope
  - Typical provoking factors
  - Do not need to inform the NDLS

- Unexplained but likely reflex vasovagal syncope with normal cardiac investigations
  - Group 1 – do not need to inform NDLS
  - Group 2 – cannot drive for 3 months and need to inform the NDLS

Solitary loss of consciousness

Needs careful history, examination and workup with focus on cardiac and neurological disorders and relevant driving guidelines applied.

If no cause found:

Group 1 cannot drive for 6 months	Group 2 cannot drive for 12 months

Future considerations

How valid is a one-size fits all approach

Should we have Medical Advisory Boards

References

- Koppel, Sjaan, et al. "What is the motor vehicle crash risk for drivers with epilepsy? A systematic review." *Journal of Transport & Health* 23 (2021): 101286.
- Xu, Ying, et al. "Who is driving and who is prone to have traffic accidents? A systematic review and meta-analysis among people with seizures." *Epilepsy & Behavior* 94 (2019): 252-257.
- Neligan A, Adan G, Nevitt SJ, Pullen A, Sander JW, Bonnett L, Marson AG. Prognosis of adults and children following a first unprovoked seizure. Cochrane Database of Systematic Reviews 2023, Issue 1. Art. No.: CD013847. DOI: 10.1002/14651858.CD013847.pub2. Accessed 15 May 2025.