



ACCREDITED TRAINING FOR THE NATIONAL
REGISTRY OF CERTIFIED MEDICAL
EXAMINERS

NEUROLOGICAL

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NEUROLOGICAL
CONDITIONS



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Neurological Exam

Examine for:

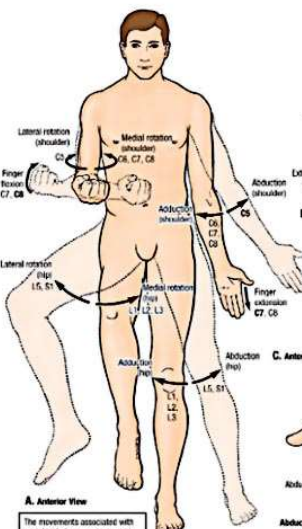
- Compromised equilibrium, coordination, speech pattern
- Asymmetrical deep tendon reflexes
- Abnormal patellar and Babinski reflexes
- Sensory abnormalities
- Position sense abnormalities
- Ataxia



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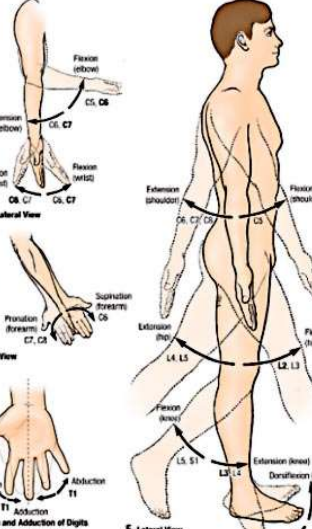


NERVE ROOTS & MYOTOMES

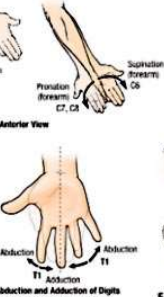


A. Anterior View


The movements associated with each boxed segment are most commonly tested to determine the neurologic level of a lesion.



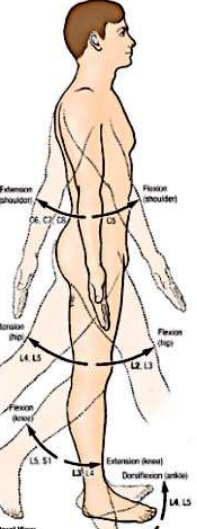
B. Lateral View



C. Anterior View



D. Anterior View



E. Lateral View

- **C5** – Deltoid; Abduction of the arm at the shoulder, Elbow flexion
- **C6** – Biceps; Flexion of the arm at the elbow, wrist extension
- **C7** – Triceps; Elbow extension
- **C8** – Small finger muscles; Finger flexion
- **T1** – Finger abduction
- **L2** – Hip flexion
- **L3** – Knee extension
- **L4** – Quadriceps; Extension of the leg at the knee, Ankle dorsiflexion
- **L5** – Tibialis anterior; Upward flexion of the foot at the ankle, great toe extension
- **S1** – Gastrocnemius; Ankle plantarflexion

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Seizures & Epilepsy: Non-Discretionary

The following drivers cannot be qualified:

- A driver who has a medical history of epilepsy or a seizure disorder, unless the driver is both off antiseizure medication and seizure free for 10 years or more
- A driver who has a current clinical diagnosis of epilepsy or a seizure disorder
- A driver who is taking antiseizure medication to prevent seizures



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Single Unprovoked Seizure

- Cause is unknown or no clear provoking trigger
- Risk of reoccurrence after five years is low

Reoccurrence Risk Factors:

- History of remote neurological insult (i.e., stroke)
- Abnormalities on an electroencephalogram (EEG)
- Focal structural lesion on neuroimaging
- A family history of epilepsy

Waiting Period: 5 years, seizure and anticonvulsant medication free

A second unprovoked seizure, regardless of the elapsed time between seizures, may constitute a medical history or diagnosis of epilepsy.



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Single Provoked Seizure (known cause)

A provoked, non-epileptic seizure or loss of consciousness resulting from:

- A drug reaction
- Withdrawal from alcohol or illicit drug
- High temperature
- Acute infectious disease
- Dehydration
- Acute metabolic disturbance
 - Hyponatremia or hyponatremia, hypocalcemia, hypoglycemia, hypomagnesemia, hypokalemia, and hyperkalemia


Certification should be deferred until fully recovered, no residual complication and not taking anti-seizure medication.

Certify If:

- Driver has fully recovered
- No residual complications
- Anti-seizure medication is not required
- Seizure recurrence is unlikely



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Childhood Febrile Seizures

- Occur in children between ages 6 months and 5 years
- Fever often stemming from infection
- Unlikely to cause seizures or residual side effects in adulthood

Certify If:
Seizure history is limited to childhood febrile seizures

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Epilepsy

Epilepsy is characterized by seizures without warning

The following drivers *cannot be certified to drive*:

- Drivers with a current clinical diagnosis of epilepsy
- Drivers taking anti-seizure medication for treatment of seizures

Waiting Period: 10 years off anticonvulsant medications & seizure free

Clearance from neurological specialist is prudent if choosing to certify a driver with established history of epilepsy



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Federal Seizure Exemption

For those who do not meet the medical guidelines for seizure disorders and epilepsy.

To apply for the Exemption the following must be met:

Epilepsy diagnosis

- Be seizure free for 8 years, on or off medication
- If taking anti-seizure meds, the plan for medication should be stable for 2 years
 - (Stable means: no change in meds, dosage, or frequency of administration)

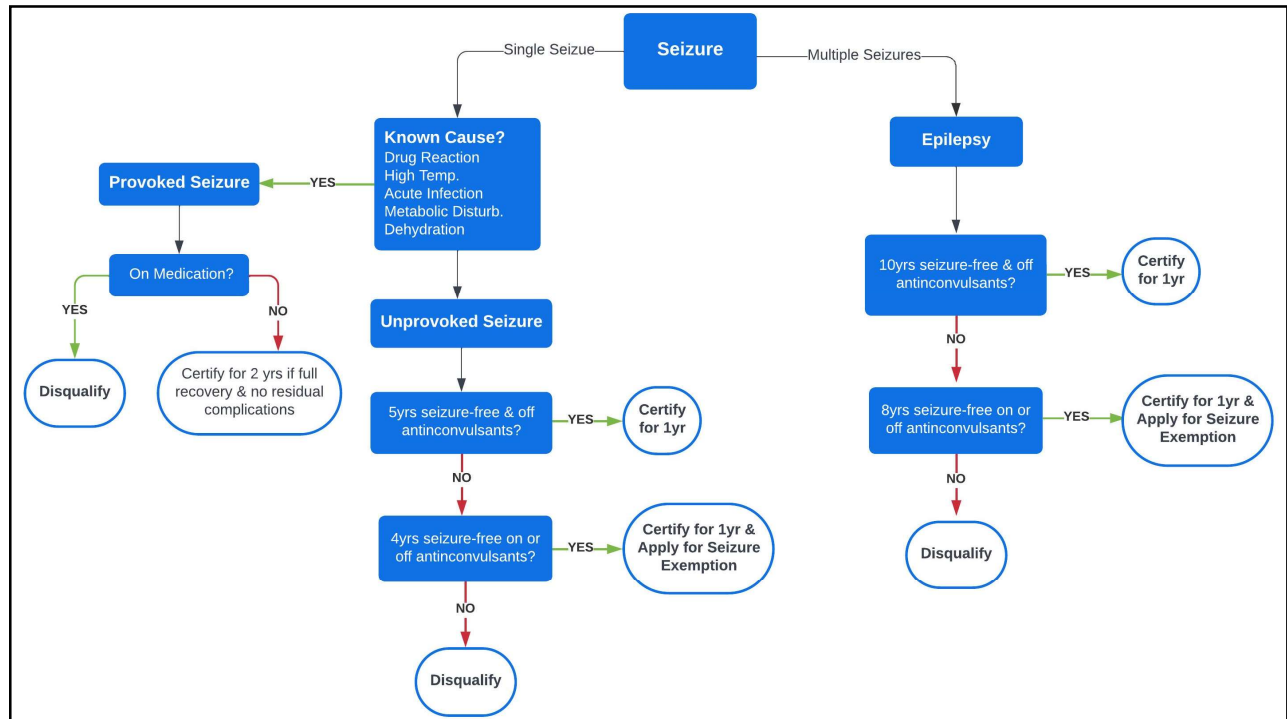
Single Unprovoked Seizure (unknown reason)

- Seizure free for 4 years, on or off medication
- If taking anti-seizure medication, the plan for medication should be stable for 2 years

The ME must mark the bullet on the form and certificate indicating that their certification must be accompanied by a federal seizure exemption. The driver is given the certificate and then must begin the seizure exemption process.

Certification Interval: 1 year

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A driver reports a single unprovoked seizure from an unknown cause that occurred 1 year ago. Since that time, the driver has been seizure free, is under medical management, and was not prescribed anti-seizure (anti-convulsant) medication. What is the certification status of this driver?

- A. Disqualified for 1 additional year, then re-certified for 1 year
- B. Disqualified for 1 additional year, then re-certified for 2 years
- C. Disqualified for 4 additional years, then re-certified for 1 year
- D. Disqualified for 4 additional years, then re-certified for 2 years

The correct answer is **C**. There is a 5-year waiting period for an unprovoked seizure during which time the driver must be seizure free and off anti-seizure medication. However, a driver can apply for the Federal Seizure Exemption program once they have been seizure free for 4 years, with or without the use of an anti-seizure medication. The recertification interval is 1 year.

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Anticonvulsant (Anti-Seizure) Therapy

- Used for control or prevention of seizures
 - There is still a risk should medication be inadvertently missed
- Also prescribed for psychiatric, antimanic, mood-stabilizing, and for chronic pain

Side Effects:

- Depressed mood
- Cognitive deficits
- Decreased reflex responses
- Unsteadiness
- Sedation

Small doses for chronic pain are less likely to have side effects that interfere with safe driving.



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Anticonvulsant Meds

Barbiturates – Phenobarbital (Luminal), Barbitol (Veronal)

- Central nervous system depressants
- Treatment for Epilepsy
- Largely replaced by benzodiazepines
 - Significantly less dangerous in overdose

Hydantoins (glycolylurea)– Dilantin

- Treatment for epilepsy, anxiety, trigeminal neuralgia, mood disorders

Carbamazepine's – Tegretol, Carbatrol

- Anticonvulsant/mood stabilizing for epilepsy, bipolar disorder, trigeminal neuralgia, ADHD, schizophrenia, phantom limb syndrome, neuromyotonia, post-traumatic stress disorder

Valproic Acids – Depakote, Depakene, Depacon

- Anticonvulsant/mood-stabilizing for epilepsy, bipolar disorder, major depression, migraines, schizophrenia

Others: Topamax (Topiramate), Neurontin (Gabapentin), Lyrica (Pregabalin), Lamotrigine (Lamictal)



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A smiling male doctor in a white lab coat with a stethoscope, standing against a blue background with white dots and a white cross. The doctor has his arms crossed and is looking directly at the camera. The background is a gradient of blue with white dots and a white cross in the bottom left corner.

HEADACHES, VERTIGO, DIZZINESS, & MINIERE'S DISEASE

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Headaches

- Migraines
- Tension headaches
- Cluster headaches
- Cranial Neuralgias
- Post-traumatic head injury syndrome
- Headaches associated with toxic substances
 - Carbon monoxide
 - Nitroglycerine
- Atypical Facial Pain

Chronic or recurring headaches can potentially interfere with a driver's ability to safely operate a CMV due to symptoms such as a visual distortion or disequilibrium associated with a migraine.

Medications used for treatment may interfere with driving:

- Sumatriptan (Imitrex)
- Topiramate (Topamax) is an anticonvulsant

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Headaches

- *Incapacitating symptoms, even if periodic or in early state of disease, warrant disqualification when interfering with:*
 - Cognitive ability
 - Judgment
 - Attention
 - Concentration
 - Sensory or motor function
 - Coordination
 - Balance

Considerations:

- What is the frequency, severity, and duration of the headaches?
- What are the symptoms associated with the headaches?
 - Visual disturbances
 - Light or noise sensitivity
 - Loss of consciousness
- Has treatment been shown to be adequate, effective, safe, and stable?

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Practice Scenario

A 33-year-old female presents for her first DOT physical prior to starting her CDL school. She has a history of headaches which have been well-controlled with regular visits to her Chiropractor. Her PCP also prescribed her Zoloft for treatment and prevention of the headaches 8.5 months ago. The driver also admits to having a seizure 8 months ago. Her Chiropractor related that the seizure was possibly caused by the Zoloft, so she stopped taking it and has not had another seizure. She denies any prior history of seizure. There is no other significant medical history and no other medication use.

- Physical exam:
 - Cranial nerves II-X all WNL
 - Normal mini-mental exam findings
 - The rest of the exam is WNL

Should this driver be certified, disqualified, or placed in determination pending?

Does she need clearance from her PCP, her Chiropractor, or another medical professional? If so, which provider and why?

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Practice Scenario Answer

The driver should be disqualified. A driver with a condition that may interfere with safe driving should not be certified or placed in determination pending.

There are multiple issues that must be resolved prior to certifying this driver.

- The ME should obtain clearance from the Chiropractor that the treatment for the driver's headaches has been effective and adequate to allow for safe driving
- The driver must be evaluated by a Neurologist to verify the etiology and prognosis of the driver's seizure
 - Is Zoloft truly the cause of the seizure?
 - Is there risk of a future seizure?
 - Will the driver require anti-seizure medication?
- If Zoloft is not the cause of the seizure, the ME should obtain clearance from the PCP that the driver no longer needs to be on the medication

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Practice Scenario Follow-up

If Zoloft is the cause of the seizure and there is no future risk of seizure, what is the waiting period and the certification interval?

Answer: This would be considered a single provoked seizure, and the driver can be certified for up to 2 years once it is verified that they are fully recovered, no residual complications and not taking anti-seizure medication.

If it was determined that Zoloft is not the cause of the seizure, and there is no identifiable cause, what is the waiting period and certification interval?

Answer: This would be considered a single unprovoked seizure. There is a mandatory 5-year waiting period, being seizure-free without the use of anti-seizure medication.

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VERTIGO & DIZZINESS

Multiple conditions may affect equilibrium

The ability to maintain balance and orientation while operating a CMV depends upon the following:

- Sensory input from the peripheral nervous system (PNS)
 - Vestibular system
 - Visual system
 - Proprioception system
- Motor integration in the central nervous system (CNS)

Inappropriate interactions within these systems may produce an unsafe degree of vertigo or dizziness.



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VERTIGO & DIZZINESS

Vertigo and dizziness can affect:

- Cognitive abilities
- Judgment
- Attention
- Concentration
- Sensory or motor function
- Coordination
- Balance

Considerations:

- What is the frequency, severity, and duration of the vertigo and dizziness episodes?
- Are the episodes likely to cause loss of consciousness or any loss of ability to control a CMV?
- Has treatment been shown to be adequate, effective, safe, and stable?

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MENIERE'S DISEASE

Chronic disorder of the inner ear that can result in dizzy spells, vertigo, and hearing loss.

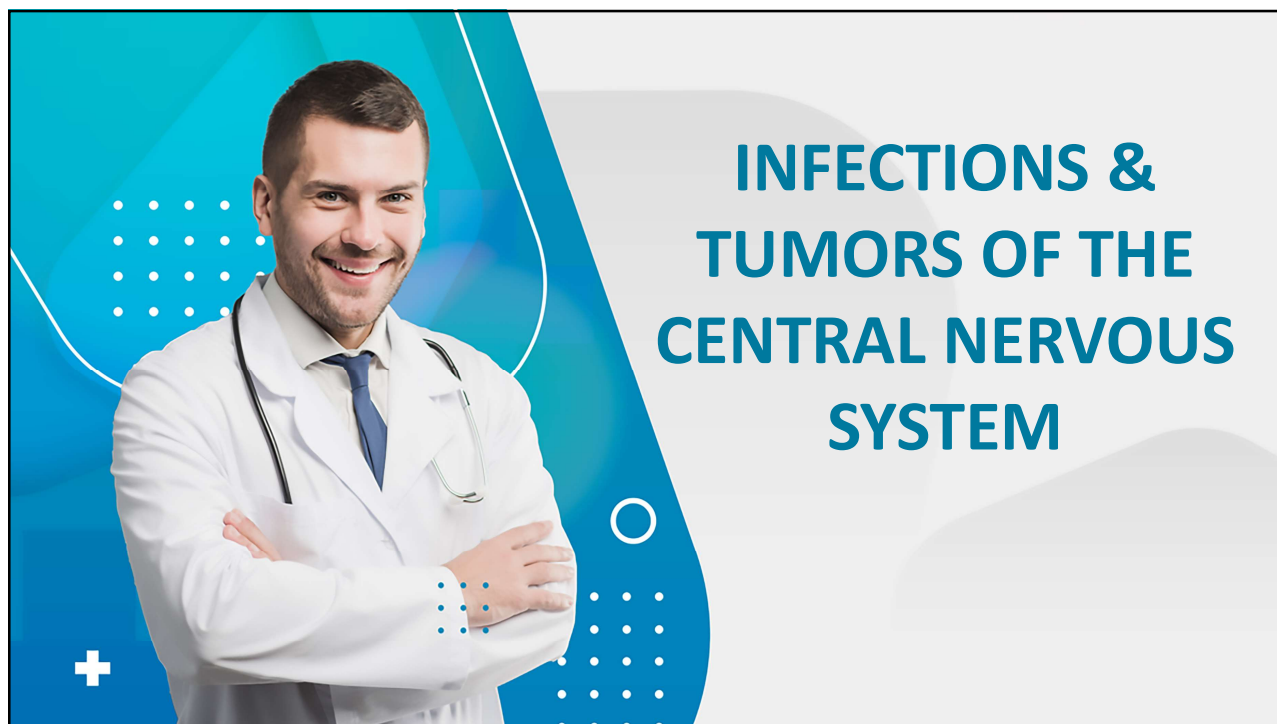
Symptoms:

- Recurring vertigo lasting 20 minutes to several hours
- Inner ear pressure
- Tinnitus (ringing, buzzing, whistling, or hissing sound)
- Hearing fluctuation
- May have long intervals without symptoms

Considerations:

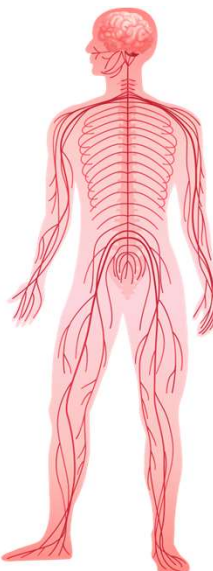
- What is the frequency, severity, and duration of the vertigo episodes?
- Are the vertigo episodes likely to cause loss of consciousness or any loss of ability to control a CMV?
- Has treatment been shown to be adequate, effective, safe, and stable?

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INFECTIONS & TUMORS OF THE CENTRAL NERVOUS SYSTEM

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Infections of the Central Nervous System (CNS)

- Acute infections can cause seizure
- Some infections are mild and resolve without special treatment
- Other infections can be severe with long-term effects
- Some infections increase the likelihood of later seizures

Drivers with a current infection of the CNS should not be certified until etiology is confirmed.

Considerations:

- Was the infection accompanied by seizure?
 - How many seizures occurred?
 - When did they occur?
 - How frequently did they occur?
 - Is the driver taking antiseizure medication?
 - What is the likelihood of seizure recurrence?
- Has the underlying infection resolved and is the driver fully recovered from the infection?
- Are there any existing residual complications from the infection?
- Was treatment shown to be adequate, effective, safe, and stable?

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Central Nervous System Tumors

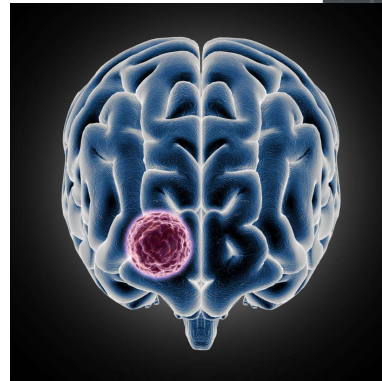
CNS tumors cause either focal or generalized neurologic symptoms

- Seizures
- Changes in:
 - Vision
 - Hearing
 - Speech
 - Swallowing
 - Cognitive ability
 - Judgment
 - Sensory and motor functions

Some benign tumors may be allowable with successful treatment

Considerations:

- Has the etiology been confirmed?
- Is the nature and severity of the medical condition likely to cause loss of consciousness or any loss of ability to control a CMV?
- Has treatment been shown to be adequate, effective, safe, and stable?



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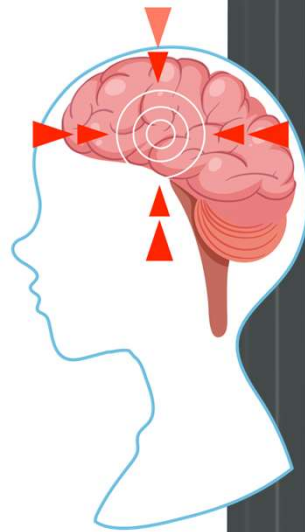


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Embolic/Thrombotic Stroke & Transient Ischemic Attack (TIA)

- Seizure risk is associated with the location of the lesions
 - *Cortical and subcortical* deficits (both being Cerebral) have an increased risk
 - *Cerebellum and brainstem* lesions are not at risk
- Cerebral infarctions can cause residual intellectual and/or physical impairment
- *Risk of recurrent event is highest during the first 7-9 months*
- Most will recover within 1 year
- Deficits that remain after one year are usually permanent
- Accompanied seizure may constitute a diagnosis of epilepsy
 - Indicates an increased risk of a future unprovoked seizure

For the NRCME test, always consider a one year waiting period from the time of the stroke before the driver can be certified.



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Transient Ischemic Attack

- Usually lasting more than a few seconds but less than 20 minutes
- Symptoms can persist for 24 hours
- Individuals experience a full resolution of symptoms
- 1 in 3 individuals who have a TIA will eventually have a stroke
 - 50% occurring within a year of the TIA



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Embolic/Thrombotic Stroke & Transient Ischemic Attack (TIA)

The ME evaluates the status of the medical condition and determines if the driver is safe to operate a CMV

- The ME may consult with specialists and request additional evaluation to assist in making a physical qualification determination

Exam should include an assessment of:

- Cognitive abilities
- Judgement
- Attention
- Concentration
- Vision
- Physical strength and agility
- Reaction time

Considerations:

- Has the etiology been confirmed?
- Are there any neurological residuals?
- Are seizures present?
- Has a diagnosis of epilepsy been made?
- Is the nature and severity of the medical condition likely to cause loss of consciousness or any loss of ability to control a CMV?
- Has the driver has been evaluated and treated by a medical provider or neurologist?
- Has treatment been shown to be adequate, effective, safe, and stable?

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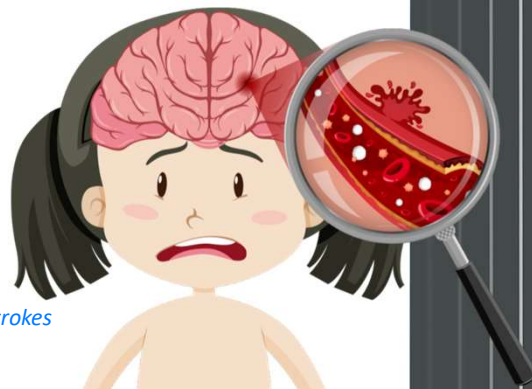
Intracerebral and Subarachnoid Hemorrhage

Intracerebral Hemorrhage = bleeding into substance of the brain

Subarachnoid Hemorrhage = bleeding into the spaces of the brain

- May result from hypertension, trauma, aneurysms, neoplasms, AV malformations, vasculopathies
- Can cause deficits in
 - Cognitive abilities
 - Judgement
 - Attention
 - Physical skills
- Seizure risk is associated with the location of the lesions
 - *Cortical and subcortical hemorrhages* have an increased risk
 - *Cerebellum and brainstem hemorrhages* are not at risk

The same qualification determination considerations apply as with strokes



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The driver has a history of a stroke 7 months earlier and presents a letter from his neurologist stating that he is cleared to return to work without restriction. The note indicates that the stroke was a cerebellar embolic stroke, and that the driver suffers no deficits in motor or cognitive abilities. All other aspects of the examination are within normal limits. The best next step is:

- A. Request an EEG
- B. Temporarily disqualify the driver
- C. Certify the driver for 1 year
- D. Certify the driver for 2 years

The correct answer is **B**. For testing purposes, the best answer is to temporarily disqualify the driver as it is “best practice” for the driver to wait a year following a stroke. The reasoning is that the risk of having another stroke or other complications is greatest in the first year.

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Traumatic Brain Injury

Injury from external physical force.

May result in:

- Diminished state of consciousness
- Coma
- Memory loss
- Emotional problems
- Decreased reasoning
- Long term cognitive or physical function

Considerations:

- Was there a loss of consciousness? If so, for how long?
- What is the level of severity?
- Do symptoms include cognitive, psychosocial, sensory, or motor function impairment?
- Has treatment been shown to be adequate, effective, safe, and stable?
- Is the underlying disorder likely to interfere with the ability to driver a CMV safely?

*It is the opinion of the 2009 Expert Panel that individuals who have sustained a **penetrating injury** to the brain **or severe TBI** should be **permanently precluded from obtaining certification to drive a CMV.***

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Practice Scenario

57-year-old male states, "I had a bleed in my head that caused a little stroke about 8 months ago." Upon further inquiry, the ME discovers that he had a left-sided stroke due to an arteriovenous malformation (AVM) which resulted in a residual right-sided hemiplegia. No surgical repair of the AVM has been performed and the driver is not sure when or if any surgical procedure is to take place. He is still attending occupational and Physical Therapy. Driver has not yet returned to work.

- Physical exam:
 - The patient walks with a limp, drags his right leg
 - Right, upper extremity hangs downward, being flaccid with a mild internal rotation at the shoulder
 - He has motor and sensory deficits consistent with right-sided hemiplegia
 - Some questions as to his recall ability (short-term) and attention span
 - The rest of the exam is WNL

Should this driver be disqualified or certified to drive, and why?

If he completes occupational and physical therapy, does he apply for a skilled performance evaluation?

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Practice Scenario Answer

- Driver has had a ruptured AVM that has not been surgically treated to prevent additional bleeding
- He has right sided hemiplegia
- He exhibits cognitive impairment during the history and PE

The driver should be disqualified

- If he completes Occupational and Physical Therapy, he will still not be able to certified. The cognitive impairments of an unrepaired AVM are disqualifying regardless of compensatory measures for hemiplegia
- An SPE may be required if AVM is surgically repaired, no cognitive deficits, OT and PT completed with satisfactory determination made (by therapist or ME), but it must be identified as a fixed deficit

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