# Emergency Neurological Scenarios

# For MO






# OBJECTIVES

- Identify the signs and symptoms associated with stroke & seizures
- Understand how to recognize a stroke early
- Understand management of a patient with seizures and stroke
- Identify any sinister cause of headache

# QUICK NEUROLOGIC EXAM

- **KEY-** Must do a complete thorough neuro exam
- Should include **5 parts:**
  - Mental status, level of alertness (GCS)
  - Cranial nerve exam
  - Motor / Sensory exam
  - Reflexes
  - Cerebellar

# CASE SCENARIO

**Case 1:**

- A 34-year-old lady presents with a c/o severe headache of gradual onset over a few hours
- Bi-frontal and associated with nausea and phonophobia
- No fever, recent illness, or any trauma
- Past history of similar episodes
- Vital signs and physical exam within normal limits

# HEADACHE

- Benign or not a sinister cause
- Frequency in ED:
  - Tension headaches – 50%
  - Migraines – 10%
  - Benign nonspecific headaches – 30%
  - Potentially serious cause – 8%
  - A life-threatening reason – <1%

# ACUTE HEADACHE – ETIOLOGY

| | |
|---|---|
| Head trauma | Hematomas |
| Vascular disorders | Subarachnoid hemorrhage<br>Temporal arteritis<br>Cerebral vein thrombosis<br>Severe hypertension |
| Nonvascular intracranial disorder | Intracranial infections |
| Substance use or withdrawal | Acute or chronic use |
| Metabolic disorder | Hypoxia<br>Hypercapnia<br>Hypoglycemia |

# ACUTE HEADACHE – ASSESSMENT

- First headache?
- Worst headache?
- Headaches on a regular basis? Is it like you usually have?
- Symptoms before and during headache ?
- Kind of pain (throbbing, stabbing, dull, other)?
- Other medical problems?
- Use of any medicines?
- Detailed examination

**History after stabilizing ABCD**

# RED FLAG FEATURES – SNOOP

**S** ystemic symptoms (fever, weight loss); Secondary risk factors (HIV, cancer, trauma)

**N** eurologic features (confusion, papilledema, focal deficits, nuchal rigidity, visual disturbances)

**O** nset (sudden, abrupt, split-seconds to minutes)

**O** lder (new onset or progressive above 50 years)

**P** rogression(major change from previous attacks in term of severity, frequency or clinical features)

# RED FLAG FEATURES

| | |
|---|---|
| First or worst headache | CNS infection, intracranial hemorrhage |
| Focal neurologic signs | AV malformation, intracranial mass |
| Triggered by cough/exertion | Mass lesion, SAH |
| Change in mental status | CNS infection, intracerebral bleed, mass lesion |
| Neck stiffness/meningismus | Meningitis, SAH |
| New onset in pregnancy or postpartum | Cerebral vein/cranial sinus thrombosis, pituitary apoplexy |

| | |
|---|---|
| Papilledema | CNS infection, mass lesion |
| Sudden onset (thunderclap headache) | Bleeding into a mass, subarachnoid hemorrhage |
| New headache in a patient with cancer, HIV, trauma or above 50 years | Metastasis, opportunistic CNS infections, mass lesion, temporal arteritis |

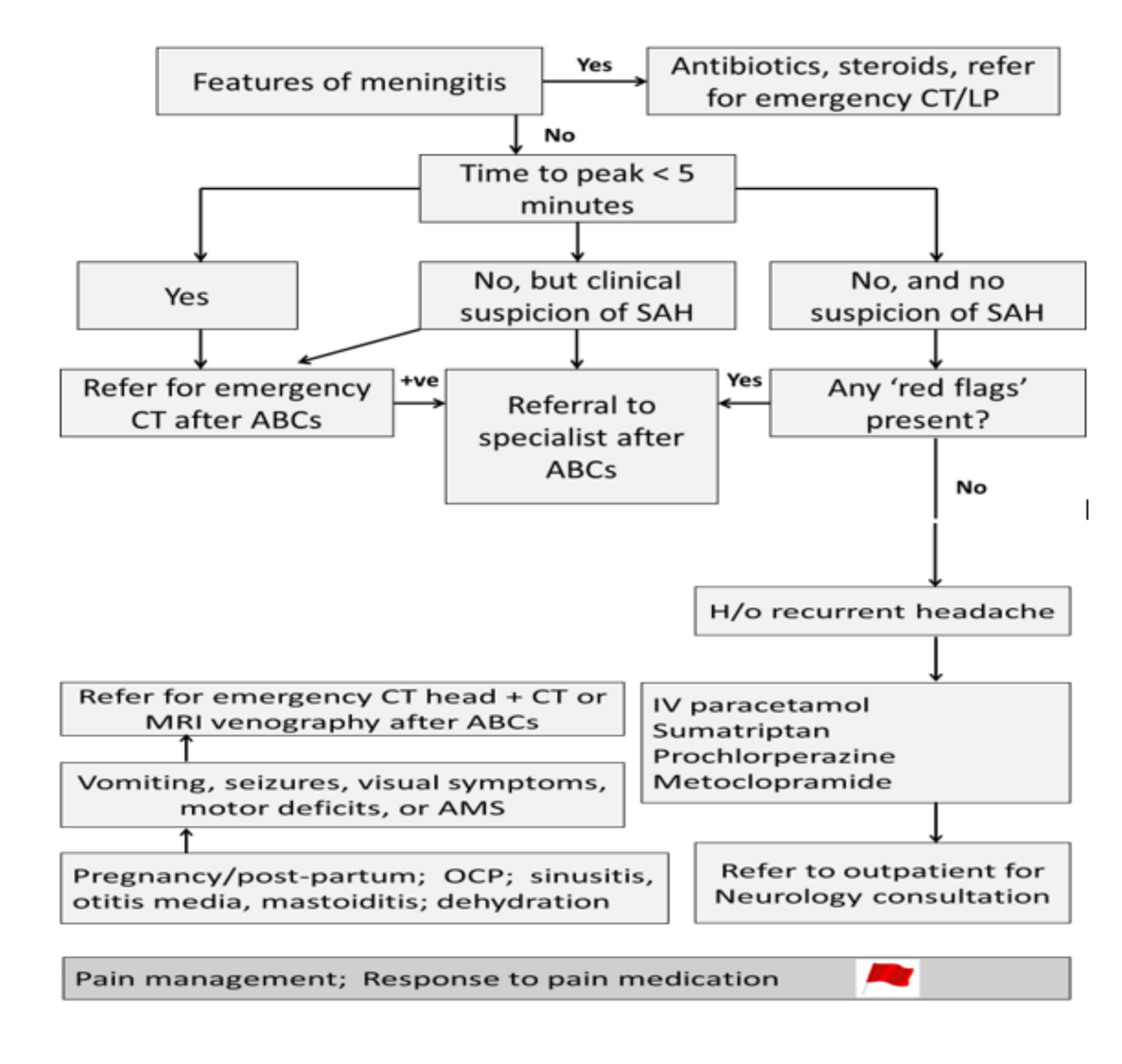
# SUBARACHNOID HEMORRHAGE

- Sudden onset (thunder-clap headache)
- Often occurs with exertion (exercise, intercourse)
- Usually severe — “worst headache of my life”
- Most severe at onset
- Frequently associated with nausea and vomiting
- Altered level of consciousness, focal deficits

# BACTERIAL MENINGITIS

- Gradual onset of headache over hours to days
- Fever, Altered level of consciousness
- Evidence of a focus of infection
- Signs of meningitis
- CT followed by LP (AMS, focal deficit, papilledema, underlying HIV/malignancy, age >50, on anticoagulants)
- Antibiotics within 1 h of suspicion
- Steroids before antibiotics

# ACUTE HEADACHE



# CASE SCENARIOS

**Case 1:**

- A 34-year-old lady presents with a c/o severe headache of gradual onset over a few hours
- Bifrontal and associated with nausea and phonophobia
- No fever, recent illness, or any trauma
- Past history of similar episodes
- Vital signs and physical exam within normal limits

# CASE SCENARIOS

**Case 2:**

- A 35-year patient with persistent headache for 2 days
- A collision while driving a bike 2 days ago
- Normal vital signs
- Physical exam unrevealing

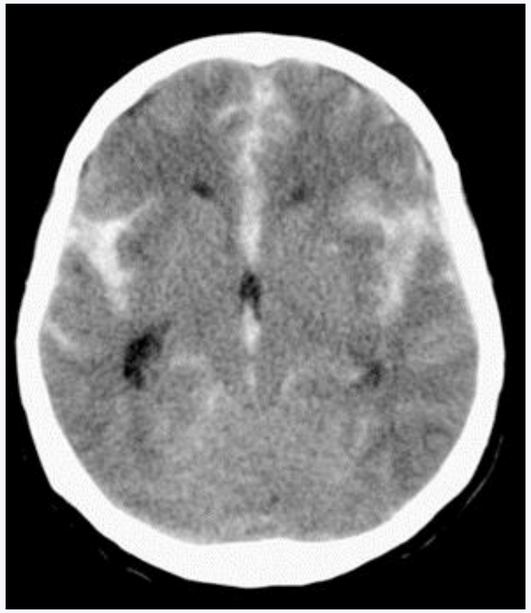
# CASE SCENARIOS

**Case 3:**

- A 28-year-old male presents with sudden onset of severe headache for 4 hours

- Maximum intensity at onset

- Conscious patient with normal examination



# STROKE

# TRANSIENT ISCHEMIC ATTACK

- **Transient ischemic attack (TIA):** Acute episode of transient and focal loss of cerebral function due to vascular occlusion lasting less than 24 hours
  - Time component removed (Evidence of infarction on imaging in up to 1/3 of patients with symptoms <24 h)
  - A transient episode of neurological dysfunction caused by focal brain, spinal cord or retinal ischemia, without acute infarction

# TRANSIENT ISCHEMIC ATTACK

A warning sign of an impending stroke (in about 10-18% of patients within 3 months)

**ABCD$^2$ Score:**

- **Age** > 60 years (1 point)
- **Blood** pressure >140/90 (1 point)
- **Clinical** features:
  - Unilateral weakness (2 points)
  - Speech deficit (1 point)
- **Duration** of symptoms:
  - < 10 min (0 points)
  - 10 -59 minutes (1 point)
  - >59 minutes (2 points)
- **Diabetes** (1 point)

**Refer for urgent admission particularly if score is 4-8**

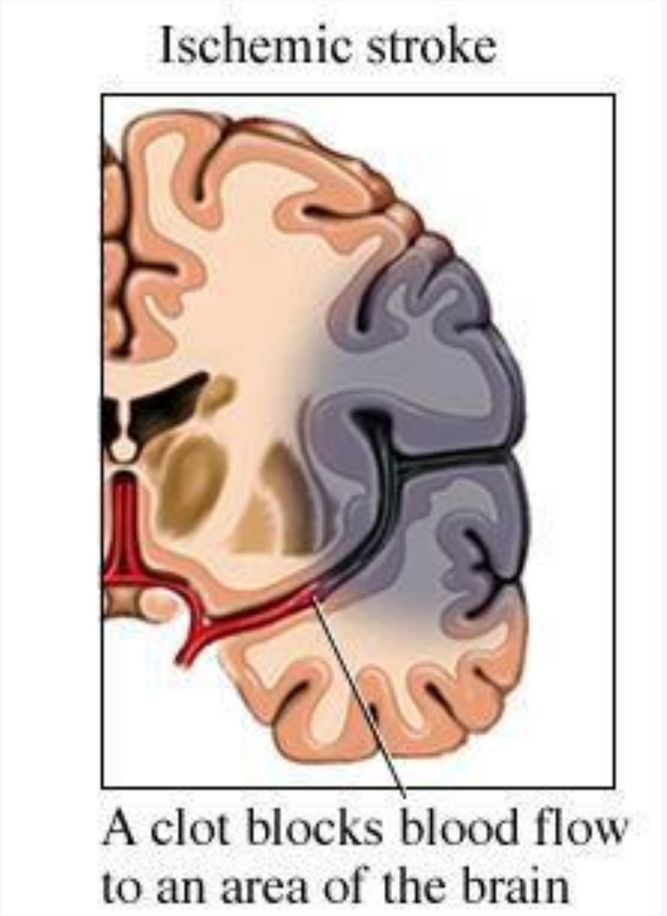
# STROKE – CASE SCENARIO

- 72-year-old male; Slept at 1:00 AM
- Weakness left arm, left leg noted upon awaking at 5.00 AM
- Brought to ED at 5.30 AM
- How will you proceed?

# ACUTE STROKE

## Ischemic Stroke

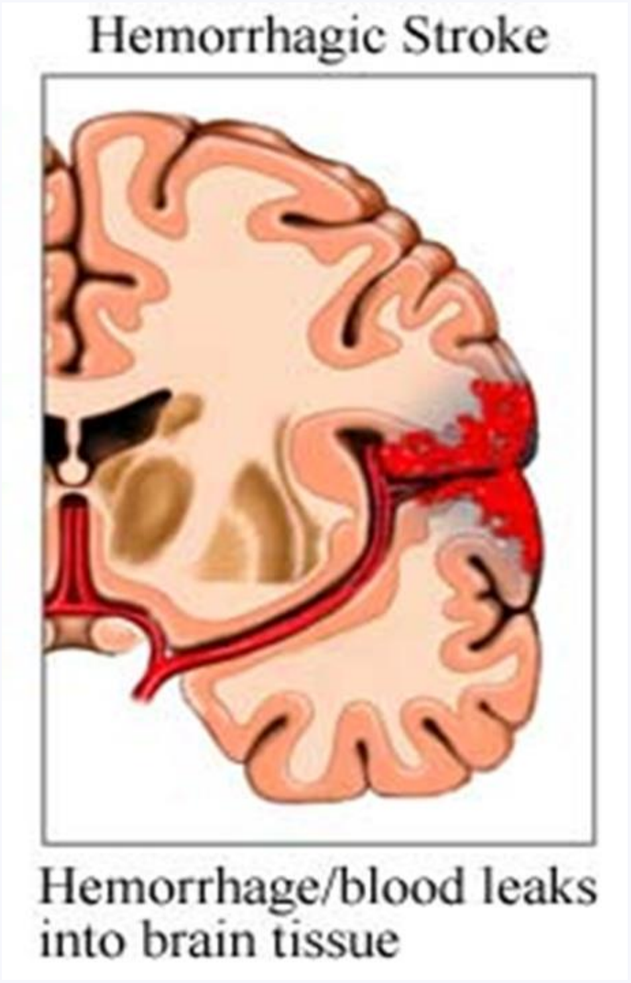
- Occlusion of vascular flow to area of brain
- 85% of strokes
- Hypertension, atherosclerosis



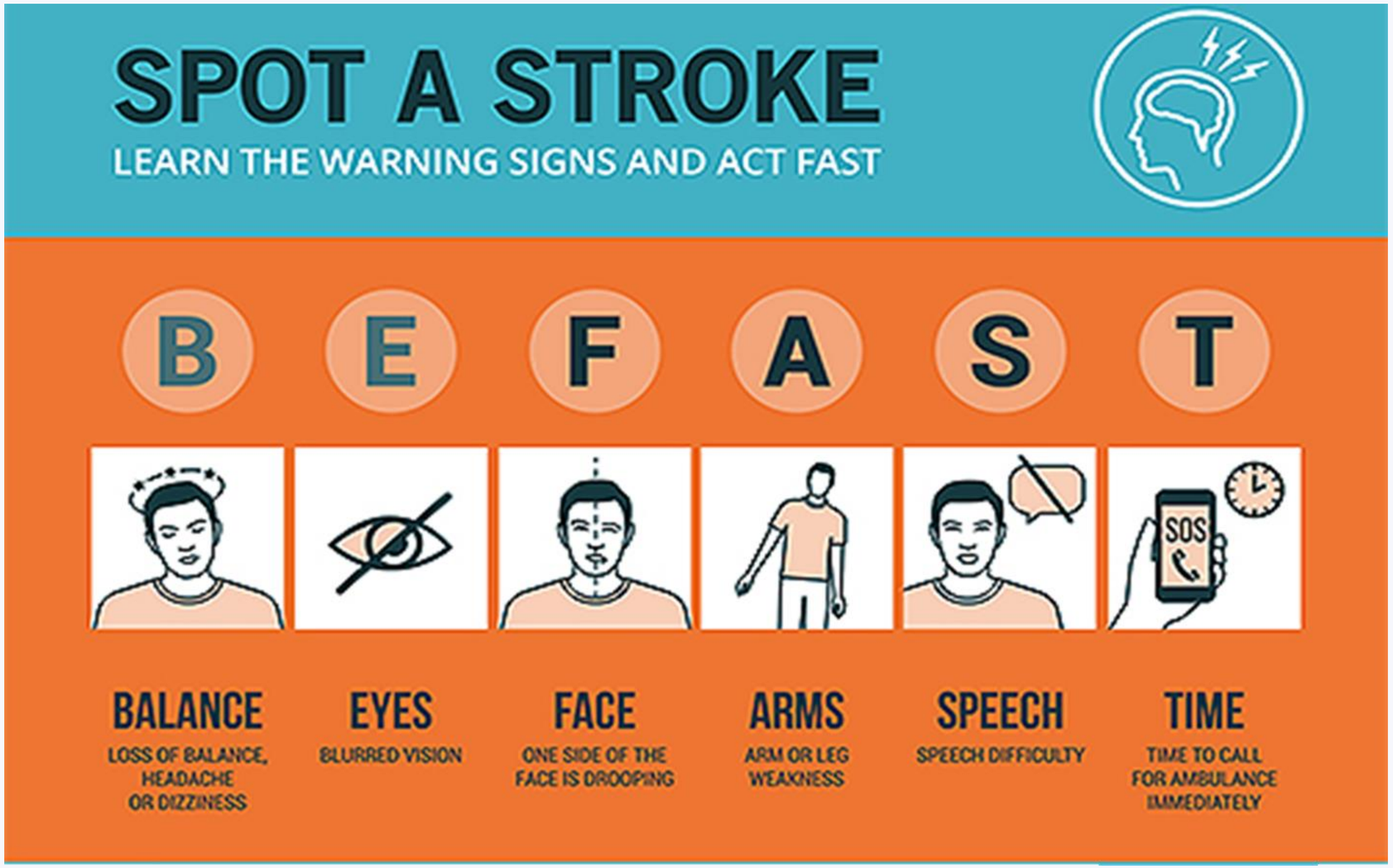
# ACUTE STROKE

## Hemorrhagic Stroke

- Bleeding into/around brain
- 15% of strokes
- Hypertension



# ACUTE STROKE – PREHOSPITAL & TRIAGE



# ACUTE STROKE – CLINICAL FEATURES

- Suspect an alternative diagnosis if:
  - Gradual onset
  - Fever
  - Fluctuating signs
  - No focal signs
  - Decreased level of consciousness (except SAH or intracerebral bleed or massive ischemia)

# STROKE – EVALUATION

- Stabilize ABC
- History: Most important is time of onset of symptoms
- Vitals
- Brief neurological exam
  - Identify possible stroke
  - Exclude stroke mimics
- Carotid bruit
- Signs of aortic dissection, arrhythmias, valvular conditions

# STROKE – MANAGEMENT

- Oxygen if SpO2 < 94%
- Perform blood glucose to exclude hypoglycemia
- IV line
- Connect a cardiac monitor; ECG
- Refer for immediate CT head and for thrombolysis or endovascular intervention

**TIME IS BRAIN!!!  DOOR-TO-NEEDLE TIME OF 60 MINUTES**

# STROKE – MANAGEMENT

- Minimal elevation of head to maintain cerebral perfusion
- Fluids: Normal saline only to keep the patient euvolemic
- Hypertension: Cautious reduction (labetalol)
- Hyperthermia: Treat with cooling

# STROKE – CASE SCENARIO

- 72-year-old male; slept at 1 AM
- Weakness left arm, left leg noted upon awaking at 5.00 AM
- Brought to ED at 5.30 AM
- Vitals: BP 179/89, HR 88, RR 16, T 36.6, O2 Sat 98% RA
- Labs unremarkable

# STROKE – MANAGEMENT

- Antiplatelet agents (if no tPA):
  - Aspirin: 160 mg -325 mg as soon as possible **only after CT excludes hemorrhage**
  - Clopidogrel:
    - Those who have failed in ASA
    - Loading dose of 300 mg

# CASE SCENARIO

- A 60 year old male presents with acute onset of vertigo for the past 2 hours
- Has some hearing loss in left ear
- How will you proceed?
- Vitals are stable
- Fully conscious with no deficits on neuro examination
- On ocular examination, he has some nystagmus
- Blood glucose normal

# ACUTE VESTIBULAR SYNDROME

- Sudden severe episode of vertigo (an illusion of movement of oneself or one’s surroundings)

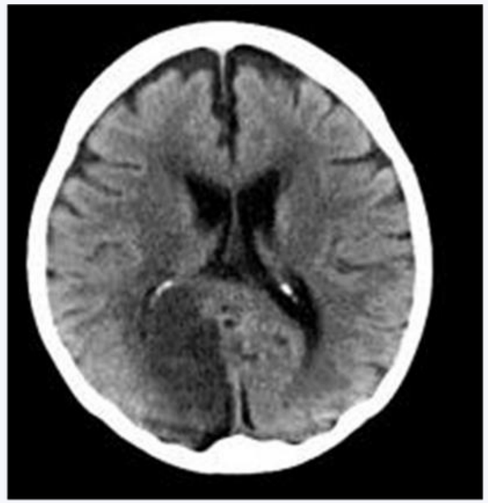
- Vestibular neuritis or a stroke

- Vestibular neuritis – peripheral nystagmus, positive head impulse test, absence of skew deviation, normal hearing

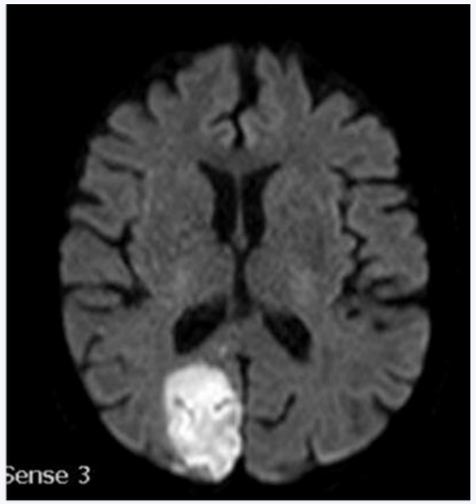
- Stroke – If all 4 conditions not met

# VERTIGO

- 20% of posterior strokes present as isolated vertigo
- Often missed
- 8 times risk of death



NCCT – Detects 26%




DWMRI – Misses 20%

# VERTIGO – HINTS TEST

## WHAT DOES IT YIELD?

- Peripheral versus Central cause of vertigo

# VERTIGO – HINTS TEST

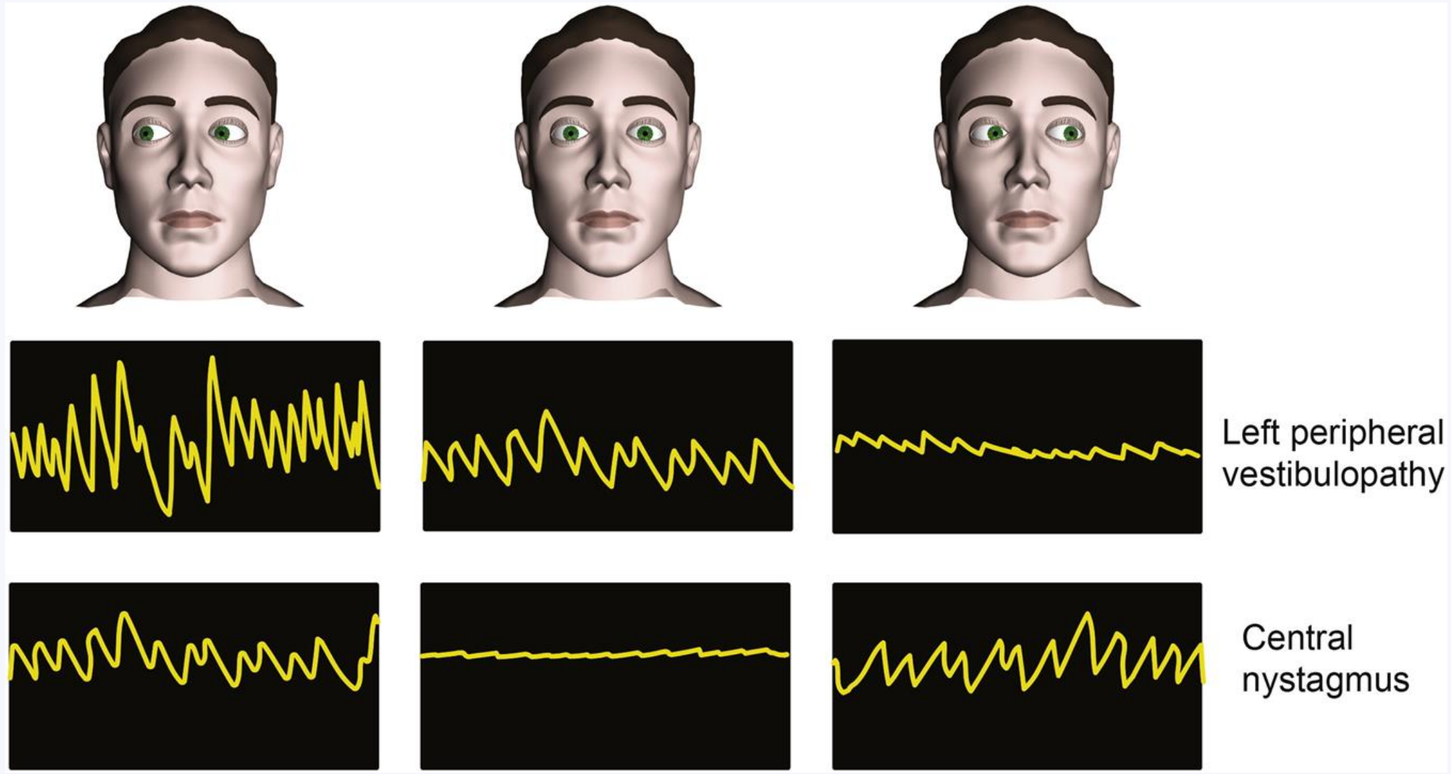
## HOW TO PERFORM?

**100% sensitive and 96% specific**

Video links:

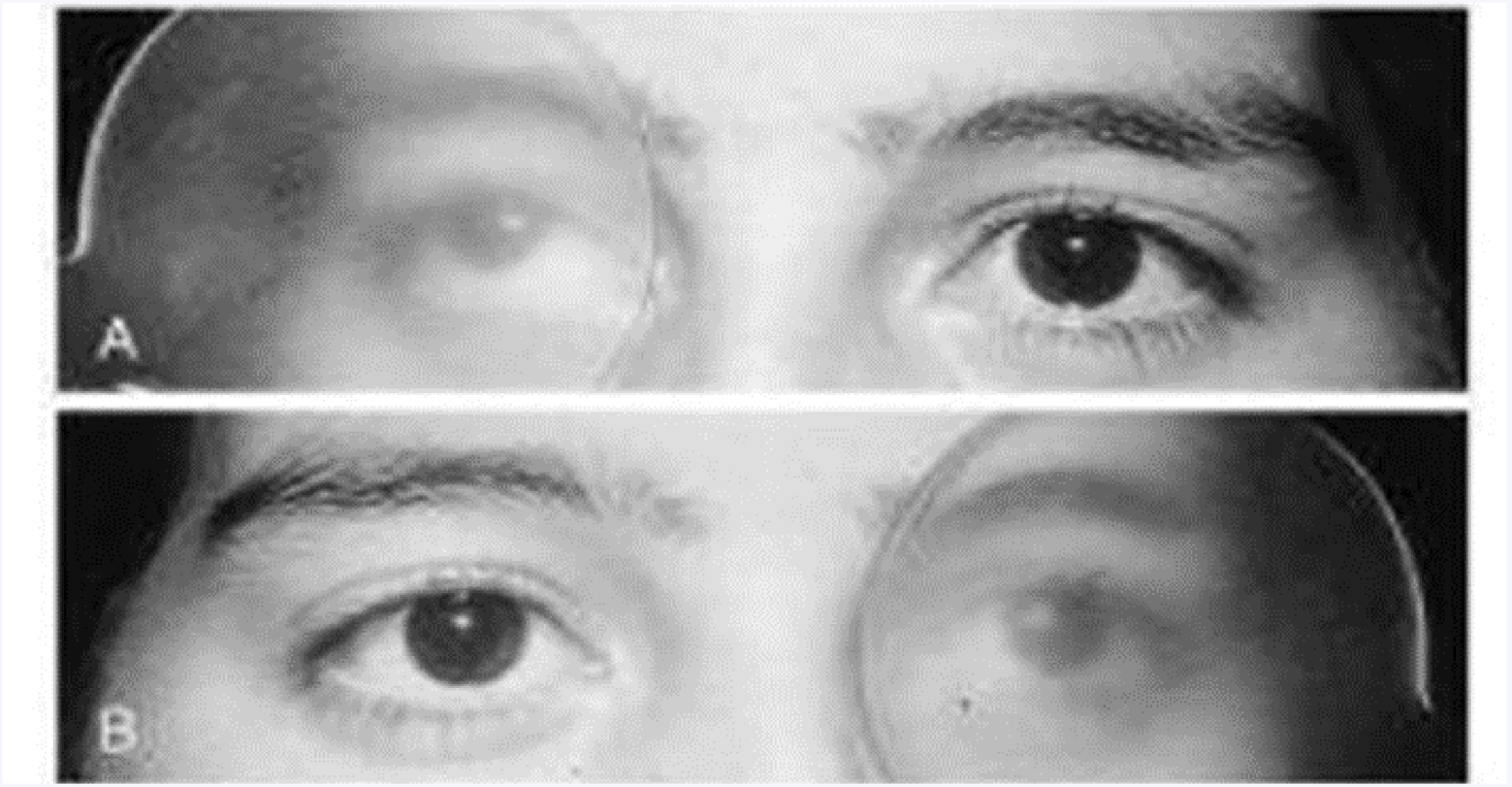
https://www.youtube.com/watch?v=CsyAroyTvns
https://www.youtube.com/watch?v=1q-VTKPweuk

# VERTIGO – HINTS TEST



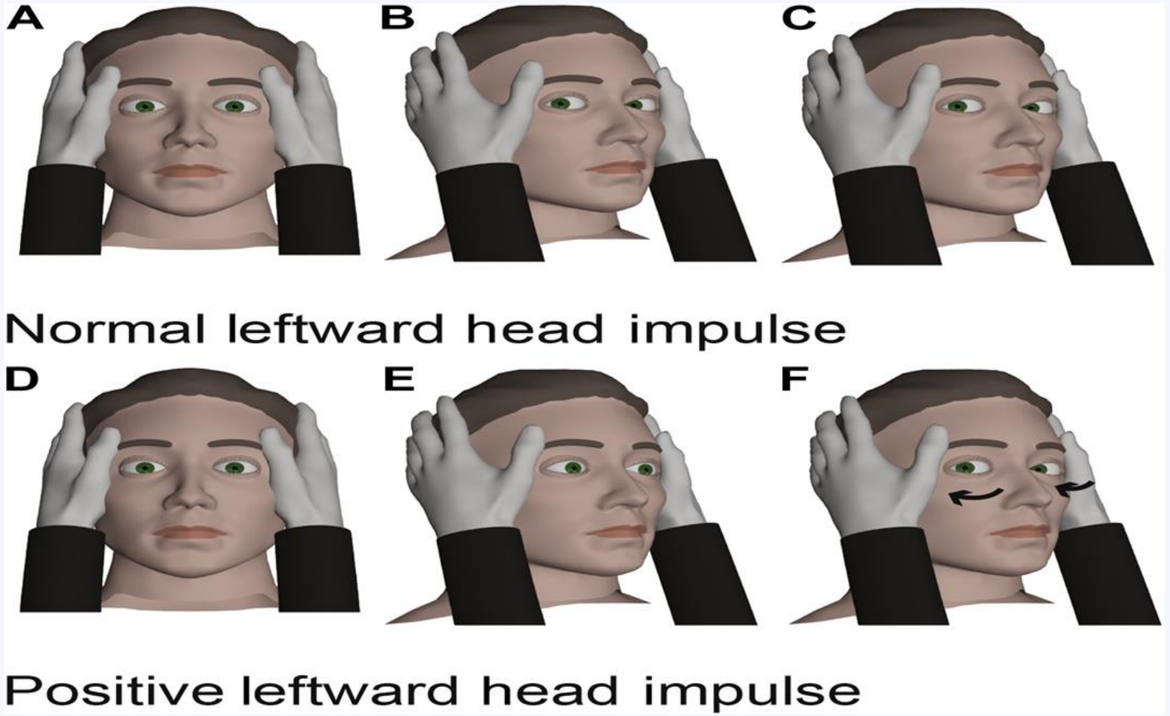

- Peripheral right-beating nystagmus that is unidirectional and enhances on rightward gaze
- Gaze-evoked nystagmus, which beats leftward on left gaze and rightward on right gaze

# VERTIGO – HINTS TEST




- **Negative vertical skew (cover/uncover):** No skew deviation on uncovering
- **Positive vertical skew deviation:** Vertical skew deviation on uncovering

# VERTIGO – HINTS TEST




- **Negative impulse test:** The subject fixes on a near target (the examiner's nose). (*A*) When the head is turned left, the intact left horizontal vestibulo-ocular reflex produces an equal and opposite eye movement that returns the eye to the target (*B, C*).

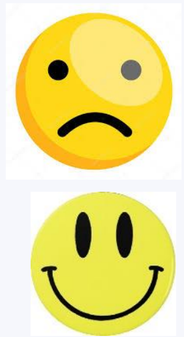
- **Positive impulse test:** (*E*) When the head is turned leftward, the eyes initially move with the head. (*F*) A refixation saccade returns the eye back to the target

# VERTIGO – HINTS TEST

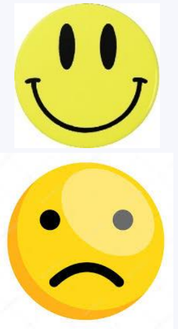
1. Nystagmus
   - Unidirectional
   - Bidirectional

2. Vertical Skew

   Cover/uncover test
   - Saccade present → Abnormal
   - Saccade absent → Normal



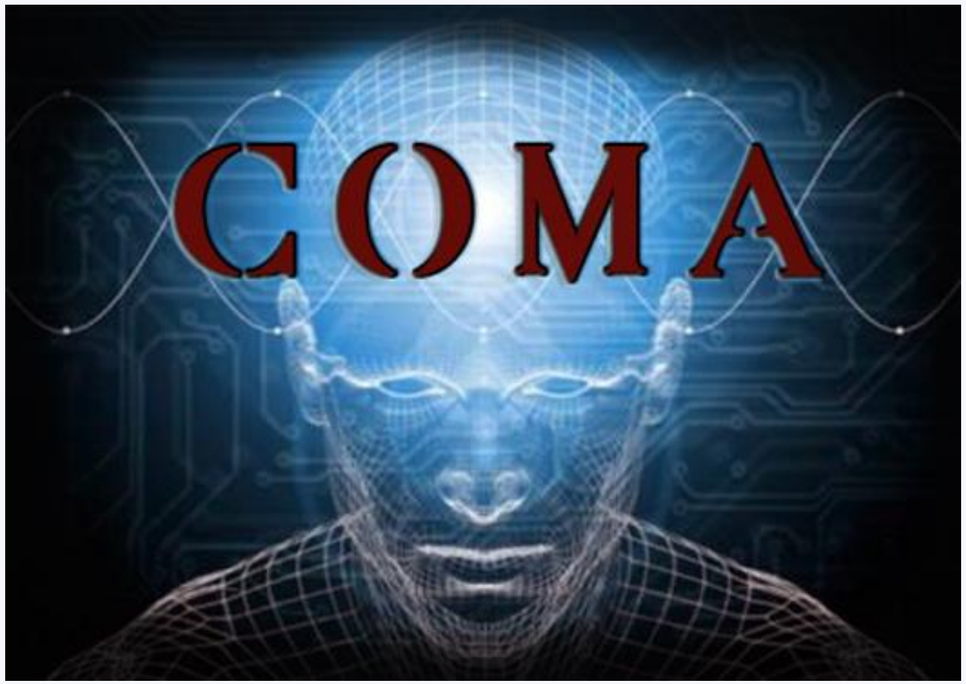
3. Head impulse test
   - Saccade present → Abnormal
   - Saccade absent → Normal



# ALTERED SENSORIUM

# ALTERED MENTAL STATUS (AMS)

- A non-specific term; patients with impaired responsiveness
- Coma: a sleep-like state, unarousable
- Lethargy, stupor and obtundation: States between alertness and coma



# ALTERED MENTAL STATUS – CAUSES

| “TIPS”: | “AEIOU”: |
| --- | --- |
| - Trauma/Temperature<br>- Infection (CNS or other)<br>- Poisoning<br>-Stroke | - Alcohol/Acidosis<br>- Epilepsy/Endocrine<br>- Insulin (hypoglycemia, hyperglycemia)<br>- Oxygen (hypoxia)<br>- U |

# AMS – INITIAL MANAGEMENT

## Airway with C-spine:

- Endotracheal intubation if:
  - GCS 8 or less
  - Ventilation:
    - Poor oxygen saturation despite supplemental oxygen
    - Predicted deterioration- in cases of shock or head injury with signs of increased intracranial pressure

## Breathing:

- Supplemental oxygen in all patients with AMS

# AMS – INITIAL MANAGEMENT

## Circulation:

- Adequate cerebral perfusion critical
- Maintain systemic blood pressure at a mean arterial pressure (MAP) of at least 80 mm Hg
- Ensure adequate IV access to facilitate above

## Drugs:

- Disability (including GCS)
- Drugs: Dextrose, Naloxone, Thiamine (if indicated)

# AMS – EVALUATION

- **Abrupt onset:** CNS hemorrhage/ischemia
- **Progression over hours/days:** Progressive CNS lesions or metabolic-toxic causes
- **Preceding events:** Antecedent trauma, fever, seizure
- **Medical history:** COPD, DM, cirrhosis, renal disease, HT, similar prior episode, drug use (CO exposure)

# AMS – EVALUATION

- Extreme **hypertension**: HT encephalopathy or ICH
- **Hypotension**: Sepsis, hypovolemia, CHF, drug ingestion
- **Hyperthermia**: Infection, heat stroke and ingestions
- **Hypothermia**: Exposure; adrenal failure, hypothyroidism, sepsis or intoxication

# AMS – EVALUATION

- **Skin:**
  - Warm, dry or diaphoretic
  - Skin rashes (meningitis, sepsis)
  - Skin track marks
- Breath odor
- Jaundice
- Evidence of trauma
- Examination of the lungs, heart and abdomen

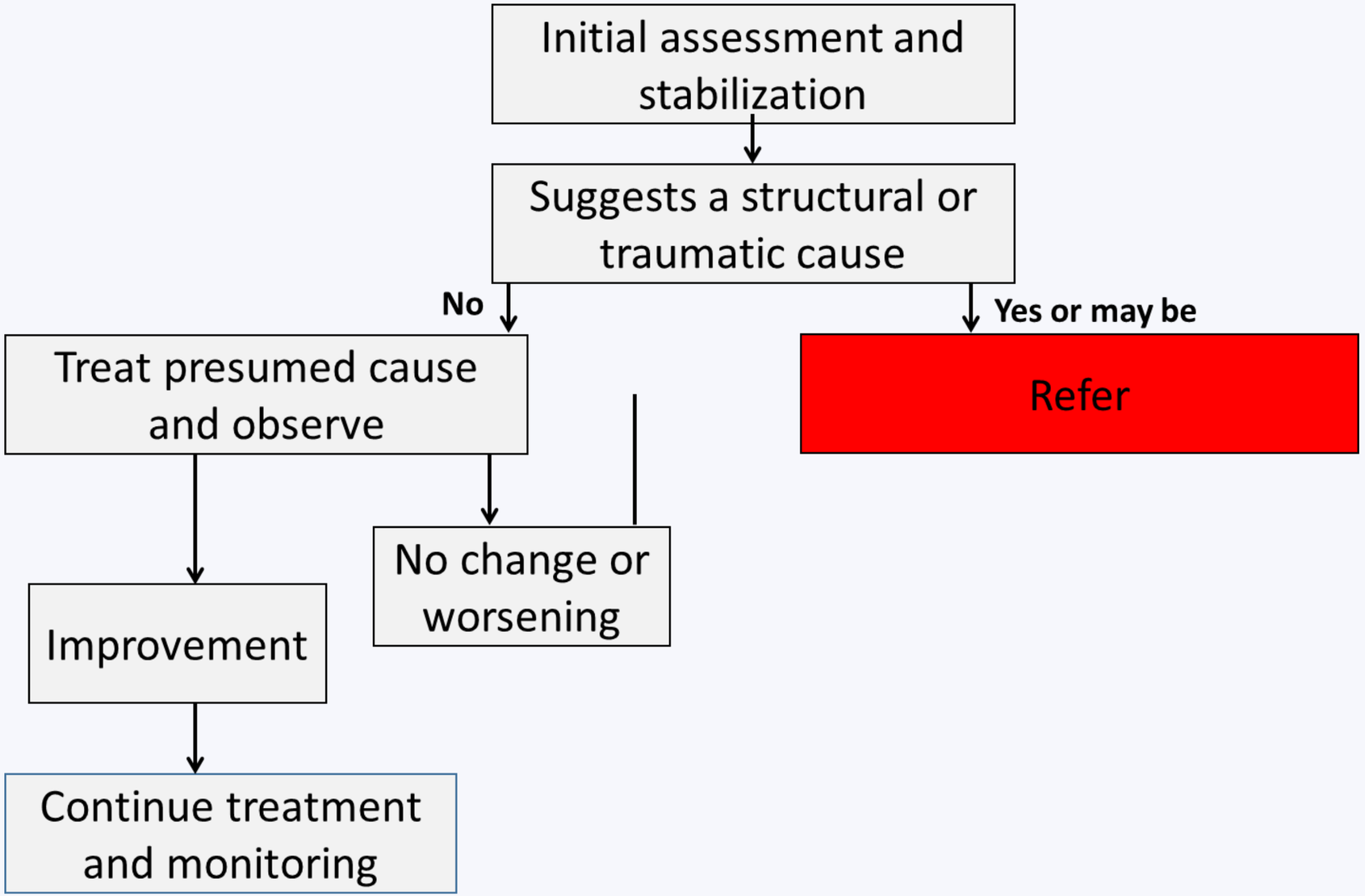
# AMS – EVALUATION

- Glasgow Coma Scale
- Scalp lacerations, contusions, deformities
- Neck rigidity (only if trauma ruled)
- Signs of basal skull fracture

# AMS – FURTHER ACTIONS

- **Goal:** To identify treatable conditions
- Testing alongside initial assessment and treatment
- Rapid blood sugar test
- Refer to airway control
- CT scan
- Lumbar puncture

# AMS – STEPS TO FOLLOW



# SEIZURE AND STATUS EPILEPTICUS

# CASE SCENARIO

- A 67-year old woman is brought to the ED in unresponsive state with rhythmic shaking in all four limbs
- What should you do first?
- What further interventions should you use?

# SINGLE SEIZURE

- First generalized convulsive seizure:
  - No AED ED if seizure provoked (treat precipitating condition)
  - No AED if seizure unprovoked without evidence of brain disease or injury. Admission not required
  - May initiate AED or defer if seizure unprovoked with a remote history of brain disease or injury. Admission ±

# SINGLE SEIZURE

- Patients with known seizure disorder with a seizure:
  - May start AED in ED
  - Either IV or oral at EP discretion
  - No loading dose required

# STATUS EPILEPTICUS

- “Continuous seizure activity lasting 30 minutes or two or more discrete seizures between which consciousness is not fully regained”

- Continuous convulsive seizure lasting more than 5 minutes, or two or more seizures during which the patient does not return to baseline consciousness

# STATUS EPILEPTICUS – CAUSES

| | |
|---|---|
| **Withdrawal:**<br>- Antiepileptics (non-compliance)<br>- Alcohol<br>- Benzodiazepines<br>- Barbiturates | **Intoxication:**<br>- Anticholinergics<br>- Sympathomimetics<br>- Salicylates<br>- Lithium, INH |
| **Acute Structural Injury:**<br>- Brain tumor/ metastasis<br>- Intracranial hemorrhage<br>- Stroke | **Cerebral injury:**<br>- Infections (abscess, meningitis)<br>- Trauma<br>- Hypoxia |
| **Metabolic:**<br>- Hypoglycemia<br>- Hypo/hypernatremia<br>- Hypocalcemia<br>- Uremia | **Eclampsia** |

# STATUS EPILEPTICUS – INITIAL MANAGEMENT

- Begin with the ABC approach
- If unable to protect the airway and/or hypoxic: try nasopharyngeal airway
- Breathing : Supplemental oxygen
- A brief neurological exam
- Look at skin, pupils and vital signs (toxidromes)

# STATUS EPILEPTICUS – EVALUATION

- Time of onset of a seizure
- History of prior seizures
- Ingestion of toxins/Ethanol
- Associated symptoms – headache, fever
- Other medical history (epilepsy, cancer, HIV, TB, substance abuse, pregnancy or recent delivery)

# STATUS EPILEPTICUS – MANAGEMENT

**Treatment and investigations simultaneously**

- Immediate bedside glucose level (while securing airway) - Start treatment once hypoglycemia excluded

- ***Do not attempt to open mouth during a seizure***

- ***Do not restrain arms/legs tightly: try and avoid injury***

# STATUS EPILEPTICUS – BENZODIAZEPINES & PHENYTOIN

**Benzodiapines**

- Lorazepam: 0.1 mg/kg (up to 4 mg) q2min IV
- Diazepam: 0.15-0.2 mg/kg (up to 10 mg) q2min IV
- Midazolam: 10 mg IM (if IV route unavailable)

**Phenytoin** (2nd line of drug)

- Phenytoin: 20 mg/kg IV administered at a rate of 50 mg/min (may repeat 10mg/kg dose once)
- Watch for cardiac arrhythmias and hypotension

**If SE continues, refer with airway control**

# STATUS EPILEPTICUS – POST-ICTAL ACTIONS

- Assure open airway by chin lift/jaw thrust
- Turn patient to one side (recovery position)
- Assess for complications
- Reassess if consciousness not regained in 20-30 mins
- Foley’s catheter for urine output and rhabdomyolysis
- IV fluids
- External cooling for hyperthermia
- Transport to higher centre

# STATUS EPILEPTICUS

| Minutes | Action |
|---|---|
| 0-5 | - Maintain airway, breathing and circulation<br>- Administer oxygen<br>- Insert an IV line<br>- Obtain blood samples for glucose<br>- Administer glucose (and thiamine) if hypoglycemic<br>- Elicit brief history and conduct brief examination |
| 5-10 | - Administer diazepam or lorazepam |
| 10-25 | - Administer phenytoin<br>- Repeat diazepam or lorazepam if seizures persist<br>- Evaluate for intubation<br>- Refer |

# NEUROLOGICAL EMERGENCIES – SUMMARY

- Look for red flags in a patient with acute headache
- Exclude hypoglycemia as a stroke mimic. Time is brain
- Exclude potentially reversible causes in patients with AMS
- Examine for complications following status epilepticus

# EVALUATION

- A patient had first episode GTC seizure in front of you while in the ED. When will you give drugs to stop it?

- A patient has been brought with left hemiplegia for 3 hours. After checking vitals, what is the next step?

- A patient presents with acute onset of vertigo for 3 hours

# EVALUATION

- A patient had sudden onset of severe headache 16 hours ago. His CT scan is normal. Pain is relieved with paracetamol.

- A patient was found on the roadside in an unconscious state. What special precaution will you take in this patient while assessing ABCD?

# Thank You