High Yield Neurological Examination

Vanja Douglas, MD
Sara & Evan Williams Foundation Endowed Neurohospitalist Chair
Director, Neurohospitalist Division
Associate Professor of Clinical Neurology
UCSF Department of Neurology

Disclosures

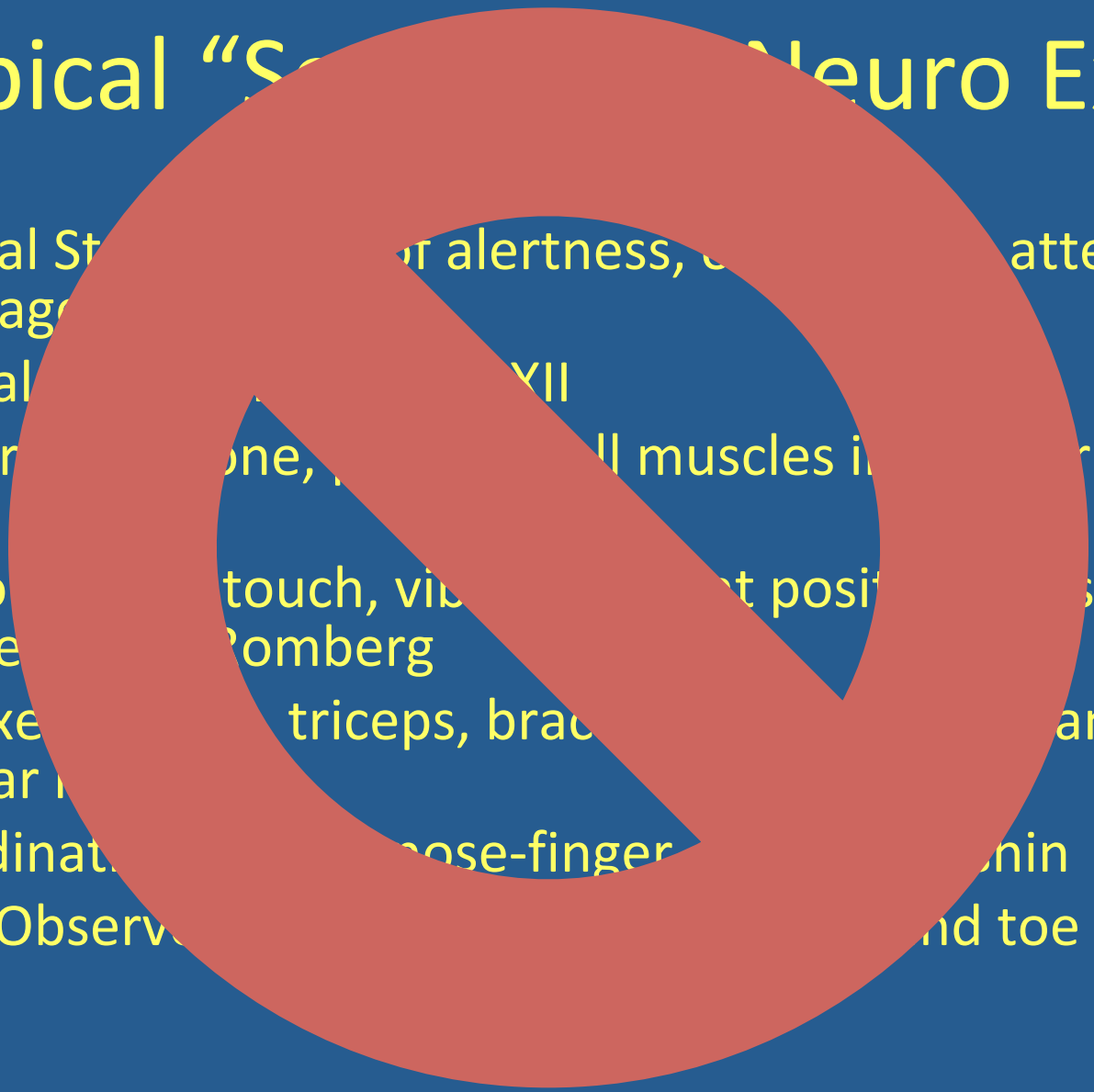
None

Purpose of Neuro Exam

- Screen asymptomatic patients
- Screen patients with symptoms that could indicate a focal neurologic lesion (e.g. back pain, headache, seizure)
- Localize the lesion in patients with neurologic deficits
  - Generate a differential diagnosis
  - Decide what test to get next (e.g. brain MRI, spine MRI, EMG/NCS, CK)

Typical "S… Neuro Exam

- Mental St… or alertness, … attention, languag…
- Cranial … XII
- Motor … one, … ll muscles i… rms and legs
- Senso… touch, vib… t posi… se, pain/ tempe… Romberg
- Reflexe… triceps, brac… ankles, plantar …
- Coordinat… ose-finger … hin
- Gait: Observ… nd toe walking

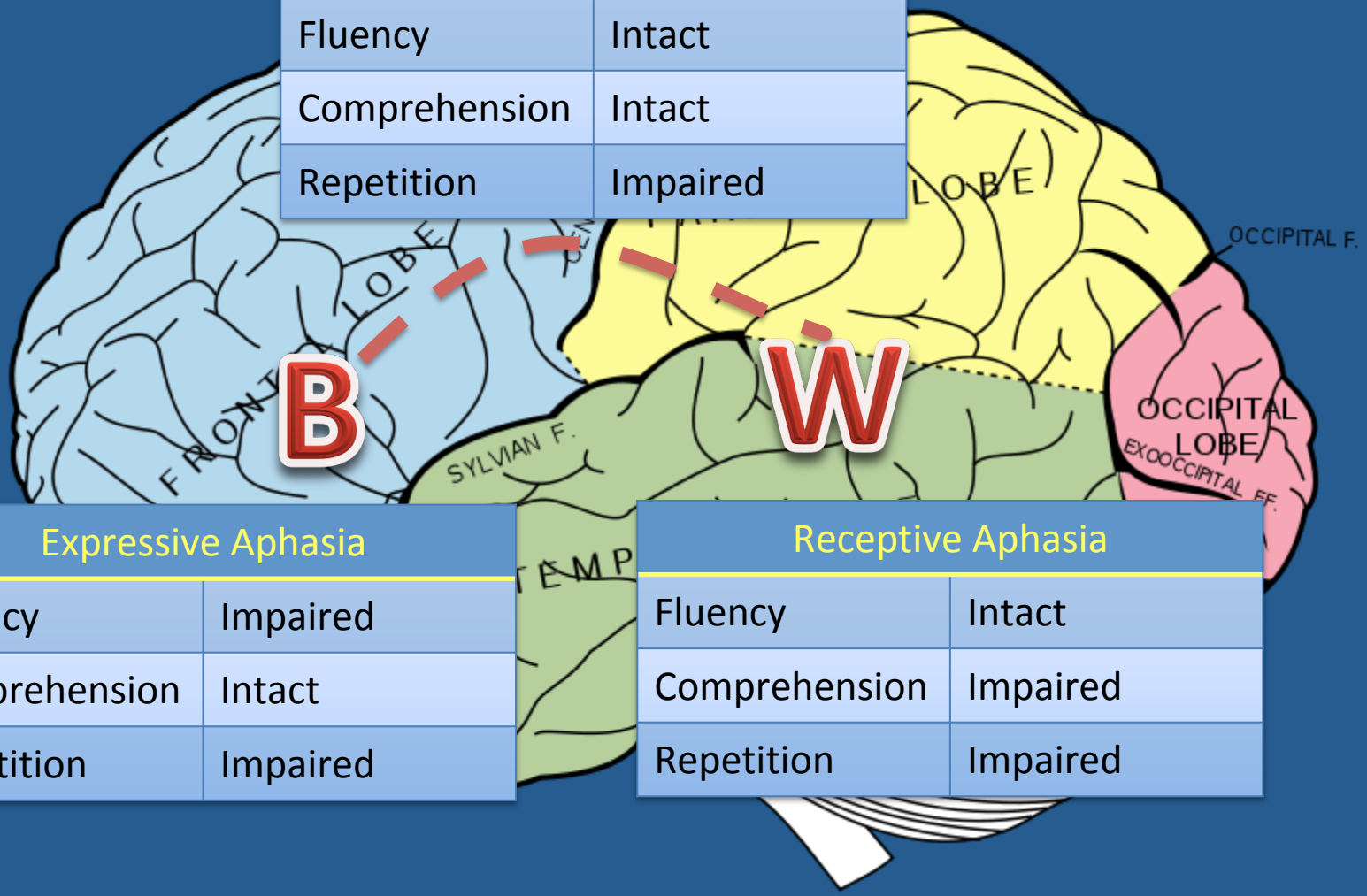


High Yield Screening Neuro Exam

- Mental Status
- Cranial Nerves
- Motor
- Sensory
- Coordination
- Reflexes
- Gait

Language

Conduction Aphasia	
Fluency	Intact
Comprehension	Intact
Repetition	Impaired



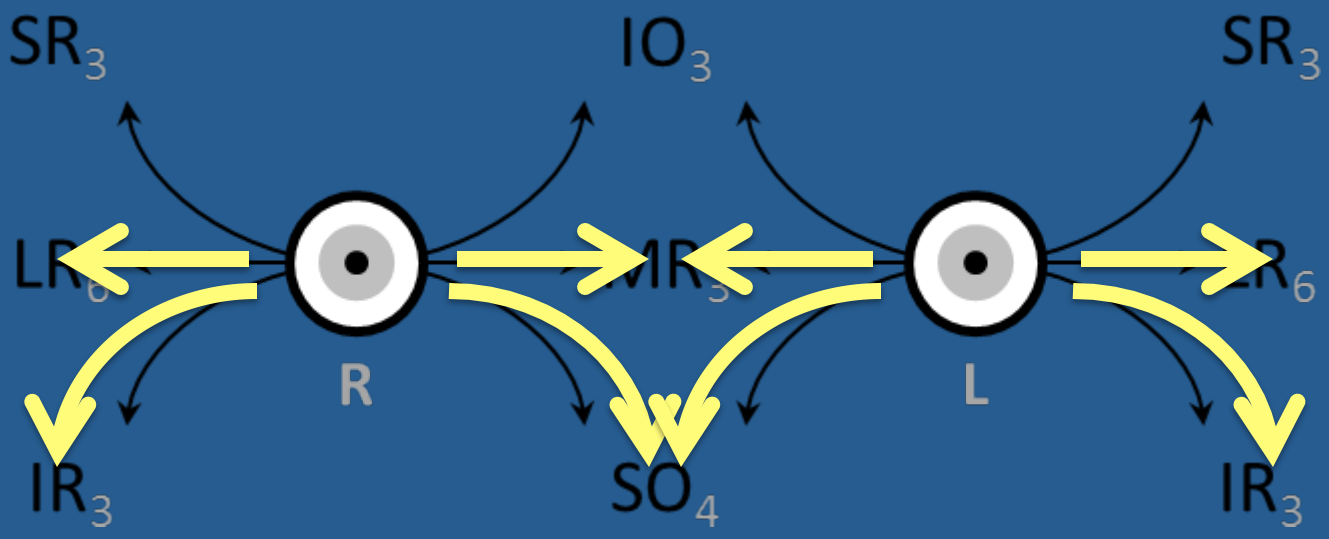
Expressive Aphasia	
Fluency	Impaired
Comprehension	Intact
Repetition	Impaired

Receptive Aphasia	
Fluency	Intact
Comprehension	Impaired
Repetition	Impaired

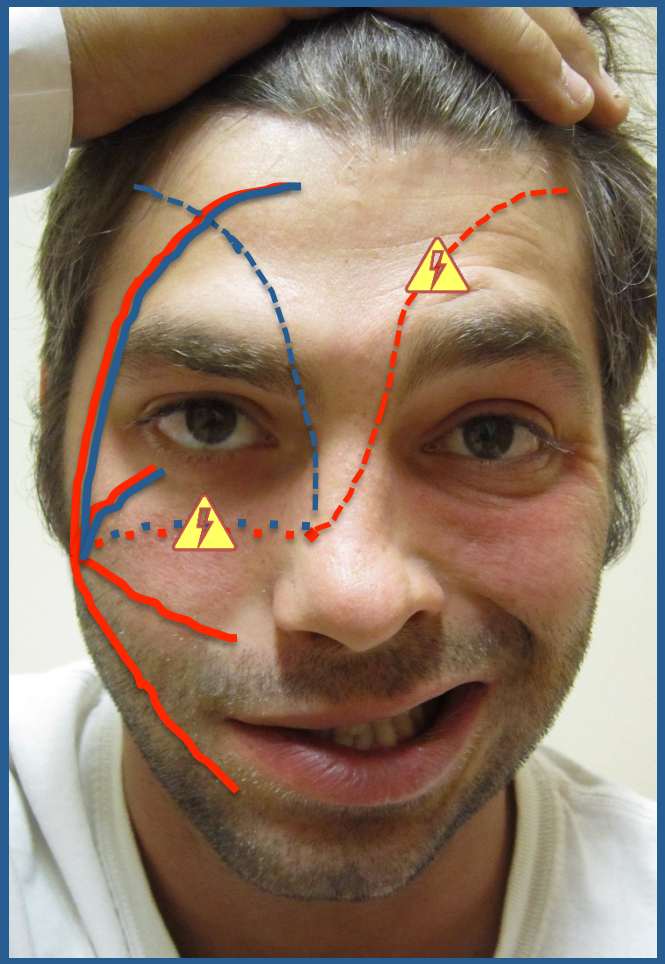
High Yield Screening Neuro Exam

- Mental Status: language, orientation, and attention
- Cranial Nerves
- Motor
- Sensory
- Coordination
- Reflexes
- Gait

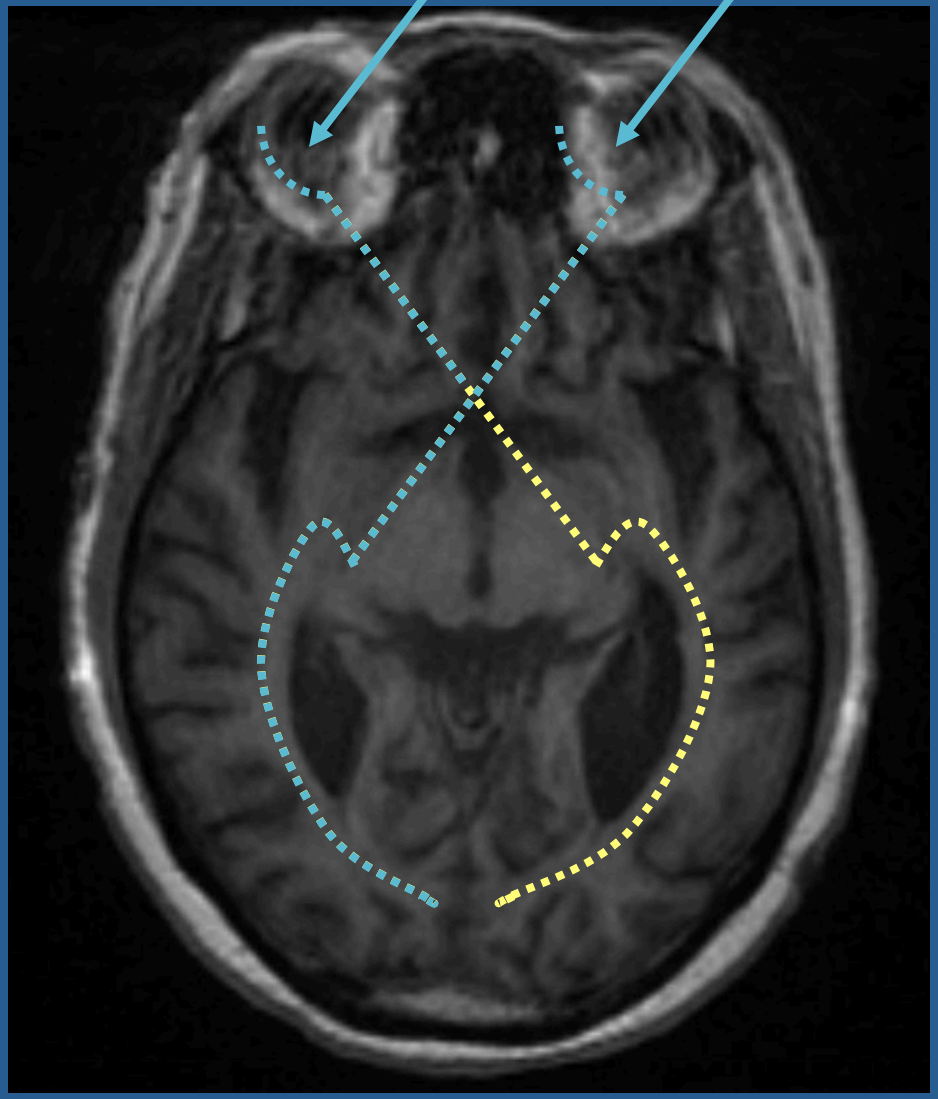
Extraocular Movements



Facial Symmetry



Visual Fields



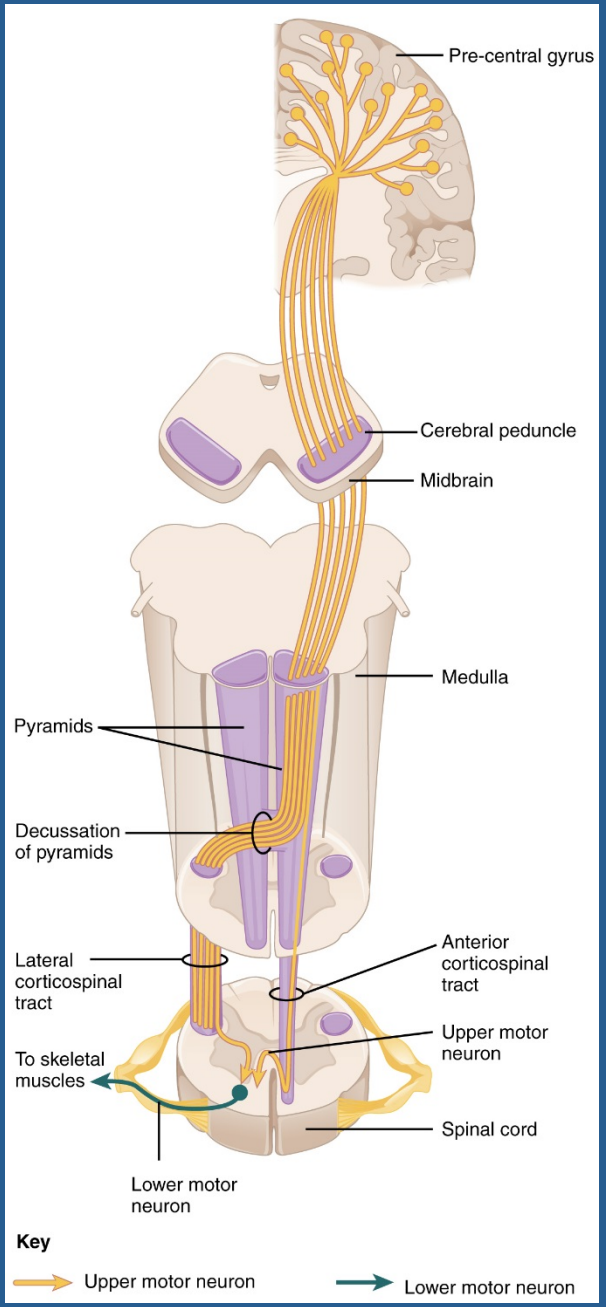
High Yield Screening Neuro Exam

- Mental Status: language, orientation, and attention
- Cranial Nerves: visual fields, eye movements, and facial symmetry
- Motor
- Sensory
- Coordination
- Reflexes
- Gait

Motor System

2 minute screen for upper motor neuron weakness:

- Pronator Drift
- Finger taps & Foot taps
- Distal extensor power:
  - Finger extensors
  - Tibialis anterior

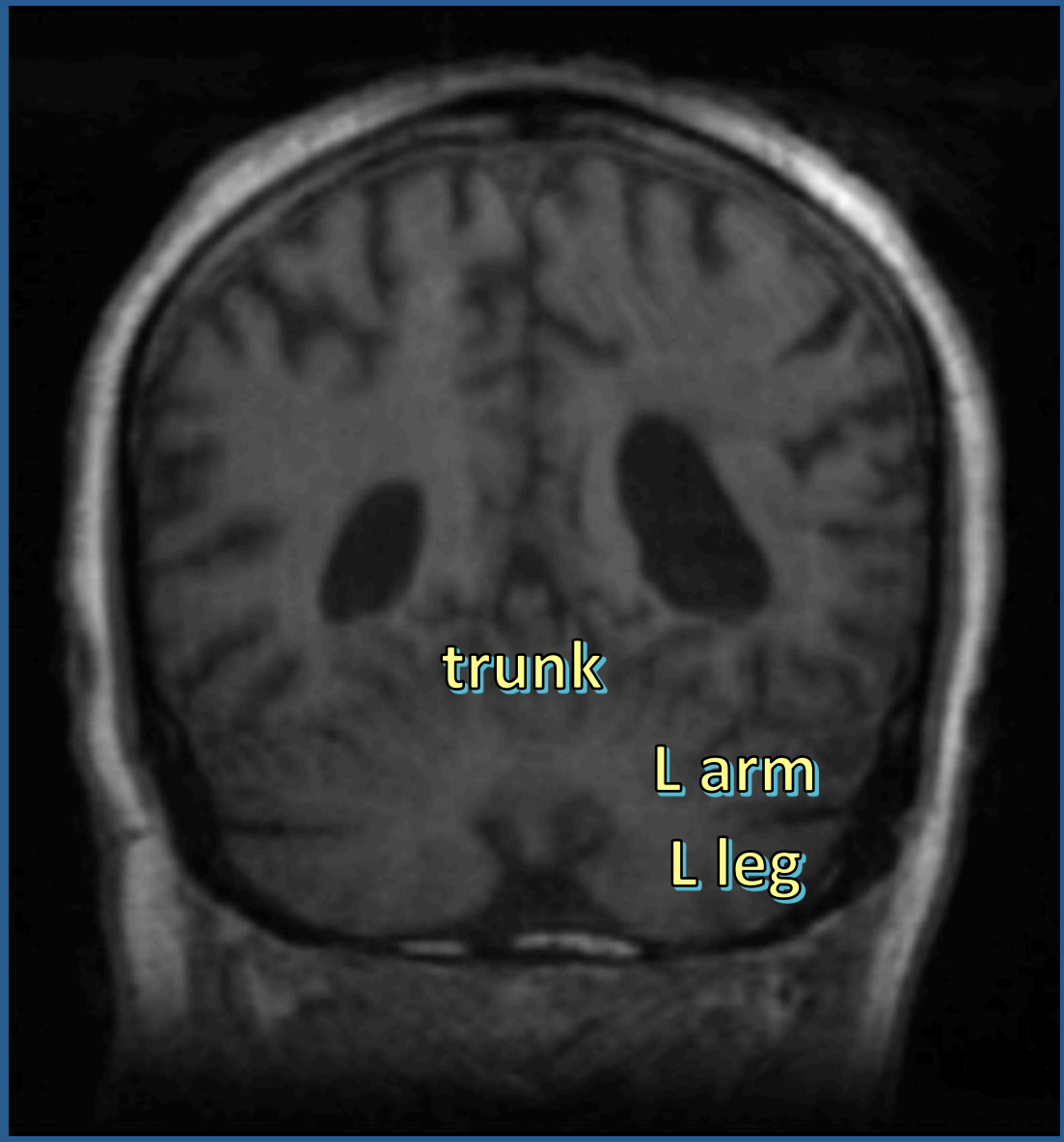


High Yield Screening Neuro Exam

- Mental Status: language, orientation, and attention
- Cranial Nerves: visual fields, eye movements, and facial symmetry
- Motor: Pronator drift, finger and foot taps, finger extensor and extensor hallucis longus power
- Sensory
- Coordination
- Reflexes: Biceps, knees, and ankles
- Gait

Coordination & Gait

- Hemispheres:
  - Finger-nose-finger
  - Heel-knee-shin
- Vermis:
  - Gait



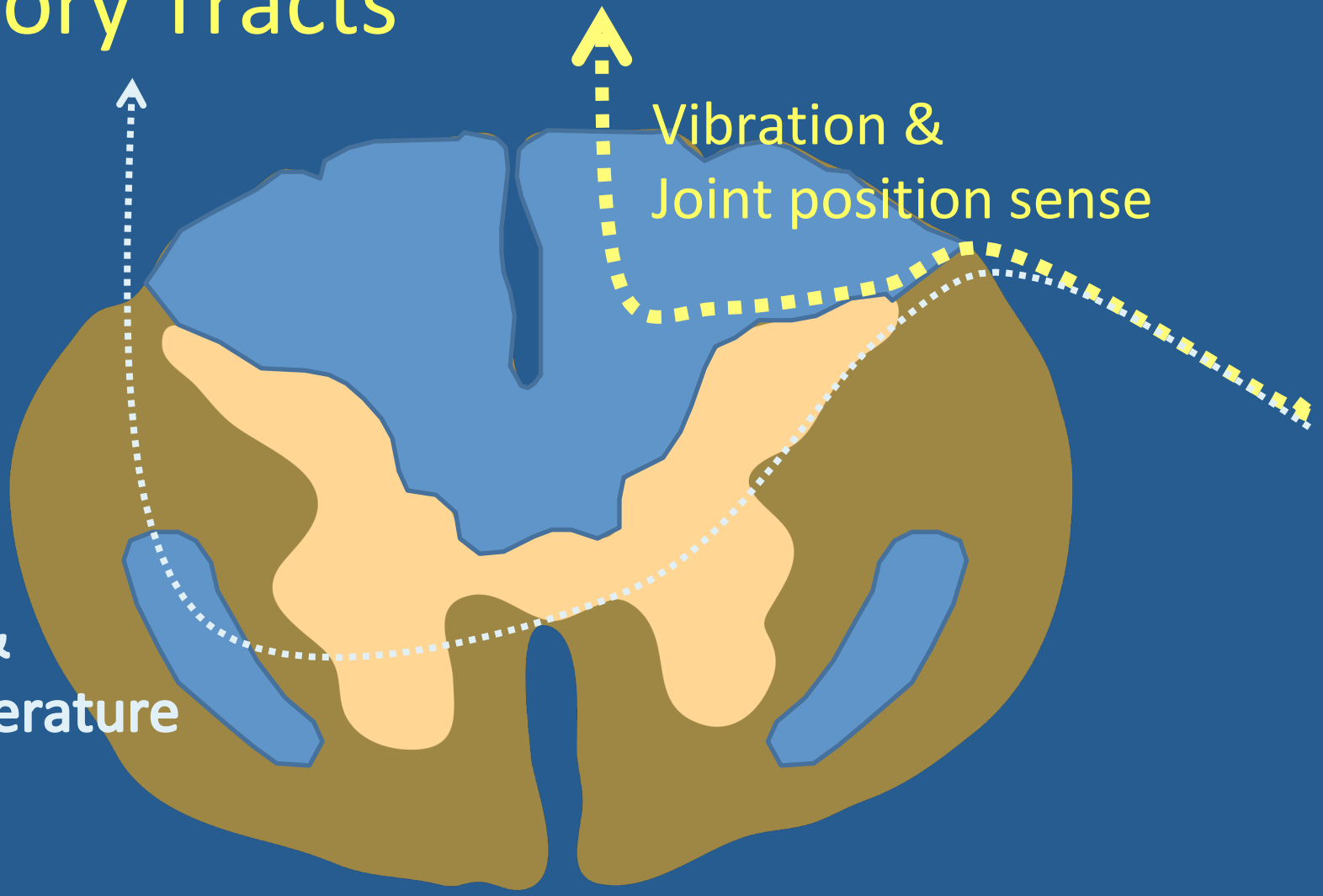
High Yield Screening Neuro Exam

- Mental Status: language, orientation, and attention
- Cranial Nerves: visual fields, eye movements, and facial symmetry
- Motor: Pronator drift, finger and foot taps, finger extensor and extensor hallucis longus power
- Sensory
- Coordination: Finger-nose-finger and heel-knee-shin (can replace HKS with gait)
- Reflexes: Biceps, knees, and ankles
- Gait: Observe gait (base, stride, posture, arm swing, turn), tandem

Why Do A Sensory Exam?

- If there are sensory complaints
- If there are balance complaints or a gait disorder
- If there is weakness

Sensory Tracts



High Yield Screening Neuro Exam

- Mental Status: language, orientation, and attention
- Cranial Nerves: visual fields, eye movements, and facial symmetry
- Motor: Pronator drift, finger and foot taps, finger extensor and extensor hallucis longus power
- Sensory: (If done, do pain OR temp + vibration OR JPS)
- Coordination: Finger-nose-finger and heel-knee-shin (can replace HKS with gait)
- Reflexes: Biceps, knees, and ankles
- Gait: Observe gait (base, stride, posture, arm swing, turn), tandem

Case Scenarios

LET'S PRACTICE!

Think Like A Neurologist

- Chief Complaint: suspected localization
- History: refine the localization
- Exam: pick maneuvers that rule in or rule out your suspicions

Patient #1

- A 23 y/o woman with a history of migraine headaches is admitted to the hospital with left leg cellulitis. On hospital day 2, she complains of a new headache. She says it's different from her previous migraines because it is "much worse" and is wondering if she needs an MRI.

Headache

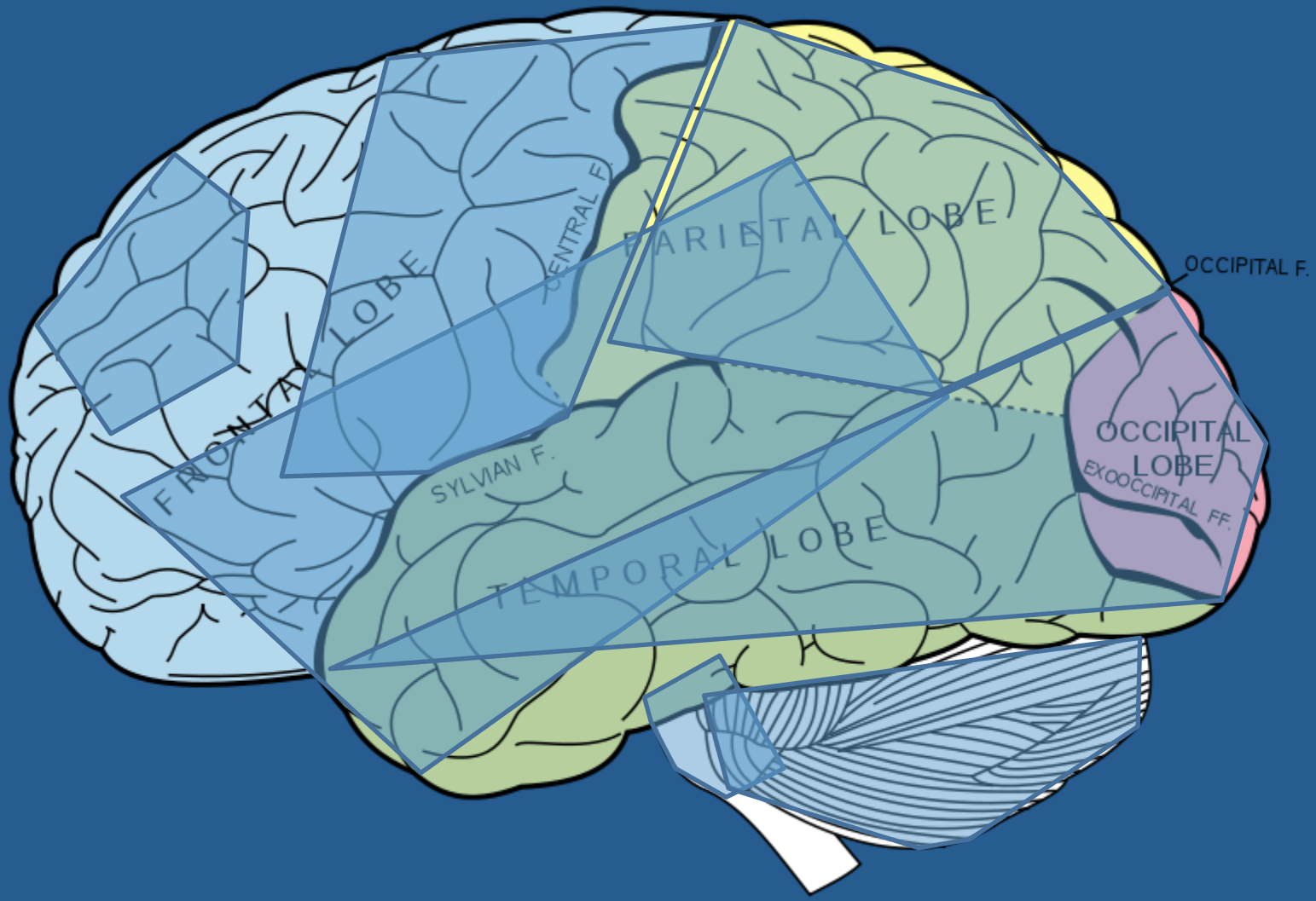
Suspected localization

- Focal brain lesion

Other potential presenting symptoms

- Seizure
- Unilateral weakness
- Unilateral numbness
- Dysarthria

Hypothesis-Driven Neuro Exam



Patient #2

- 57 y/o man hospitalized with MI is altered after his cardiac cath. He is somnolent but arousable, mumbling incoherently. His family is very concerned that he has had a stroke.

Altered Mental Status

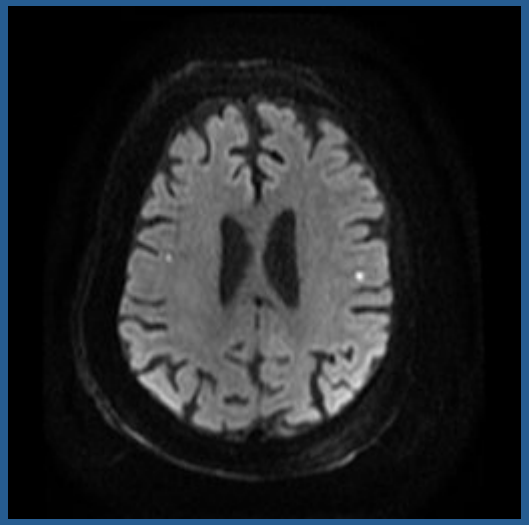
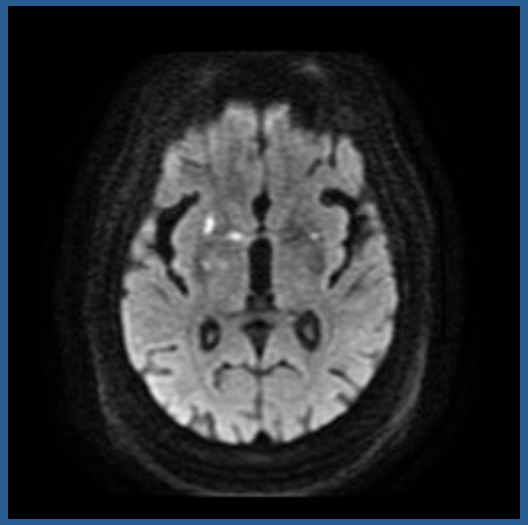
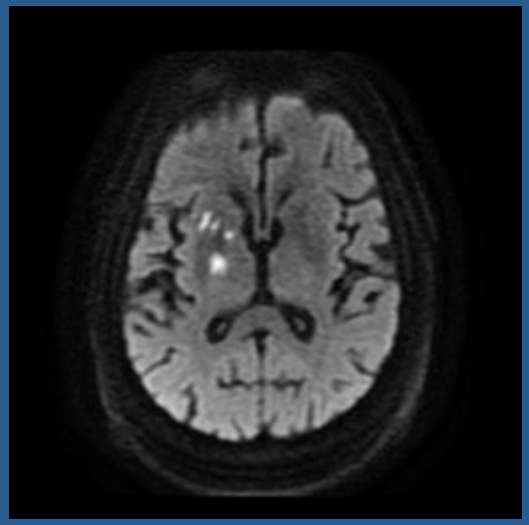
Suspected localization

- Bilateral hemispheres
- Brainstem

Patient #2 Exam

- Arouses to touch
- Names simple objects, repeats short phrases, follows simple commands
- Disoriented and unable to test attention
- EOMI; face symmetric; blinks to threat bilaterally
- Left arm drifts and hand is clumsy
- Withdraws less briskly to pain in the left leg
- Head CT is normal

Multifocal Strokes

Patient #3

- A 65 y/o man with prostate cancer presents with bilateral leg weakness and urinary urgency.

Bilateral Leg Weakness

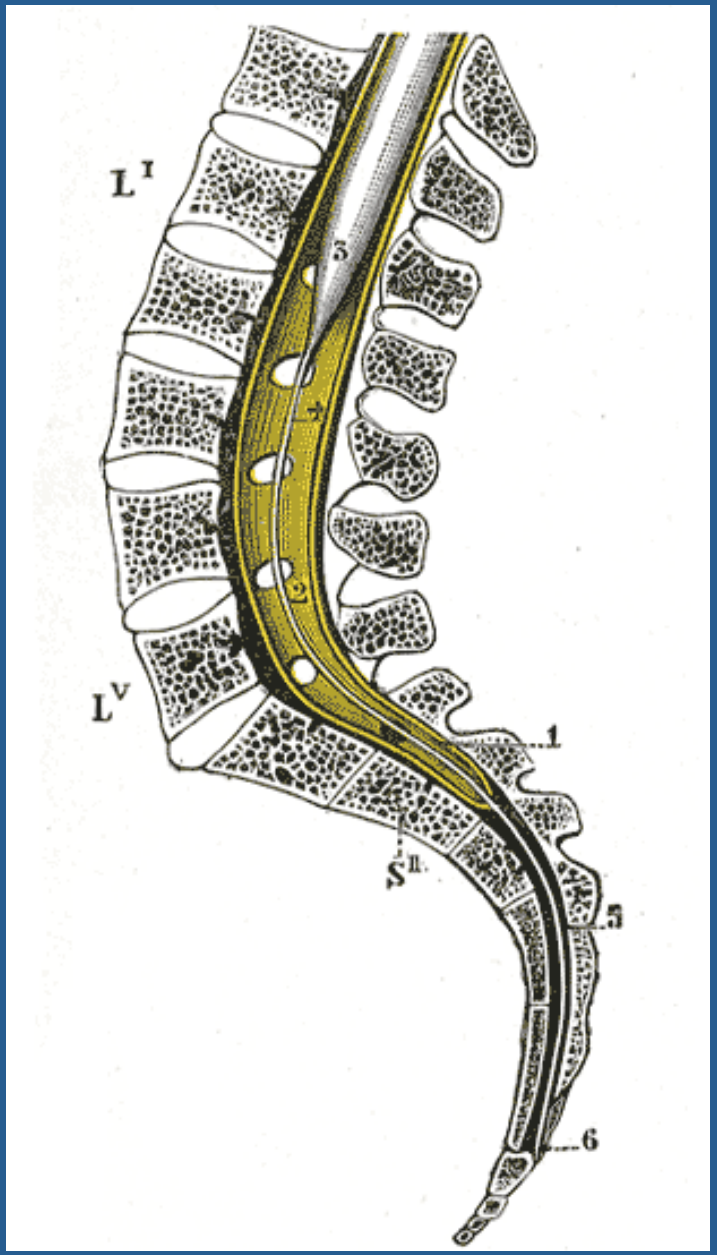
Suspected localization

- Spinal cord
- Cauda equina

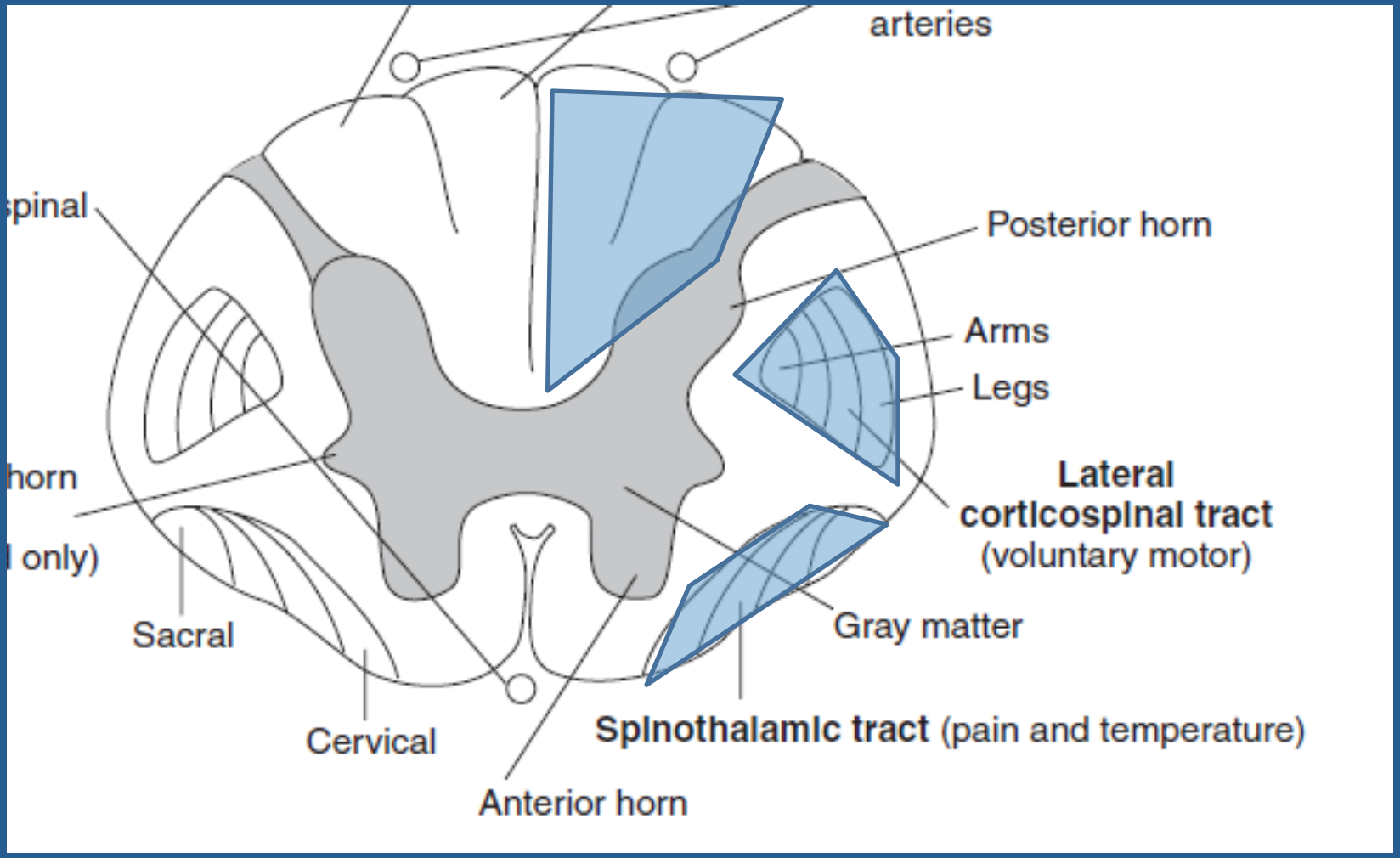
Other potential presenting symptoms

- Urinary or bowel incontinence
- Gait difficulty
- Back pain

	UMN	LMN
Pattern of Weakness	Pyramidal	Variable
Function/Dexterity	Slow alternate motion rate	Impairment of function is mostly due to weakness
Tone	Increased	Decreased
Tendon Reflex	Increased	Decreased, absent or normal
Other signs	Babinski sign, other CNS signs (e.g. aphasia, visual field cut)	Atrophy (except with problem of neuromuscular junction)



Spinal Cord Cross-Section



Patient #3: Exam

- Decreased EHL power bilaterally
- Slow foot taps
- Brisk knee jerk and ankle jerk reflexes
- Reduced joint position sense in toes
- Sensory level to pinprick at T5

Metastastic Spinal Cord Compression

Patient #4

- A 30 y/o woman with lupus, APLAS, and history of endocarditis on gentamycin presents with acute vertigo.

Vertigo

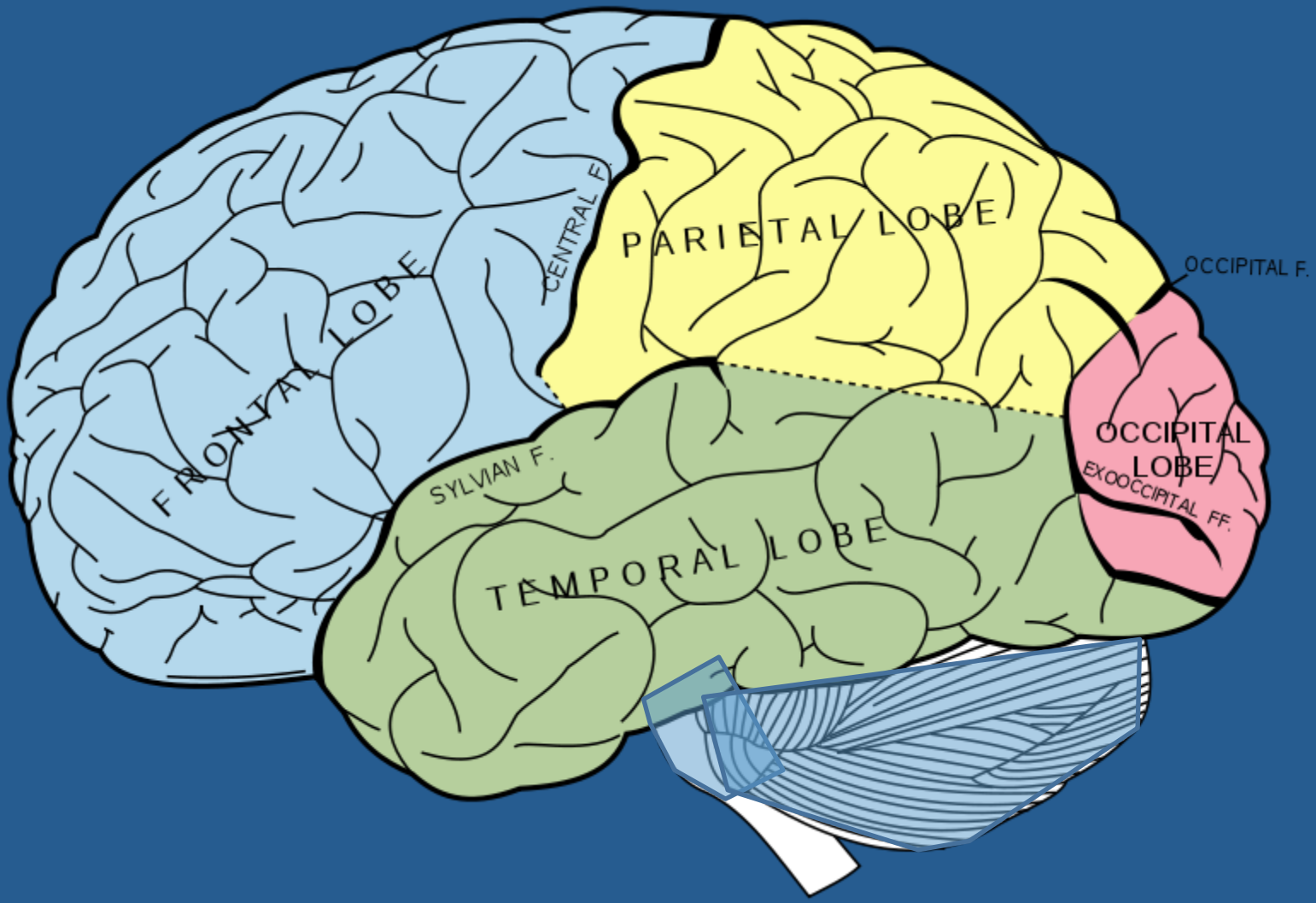
Suspected localization

- Brainstem
- Cerebellum
- Inner ear

Other potential presenting symptoms

- Imbalance

Hypothesis-Driven Neuro Exam



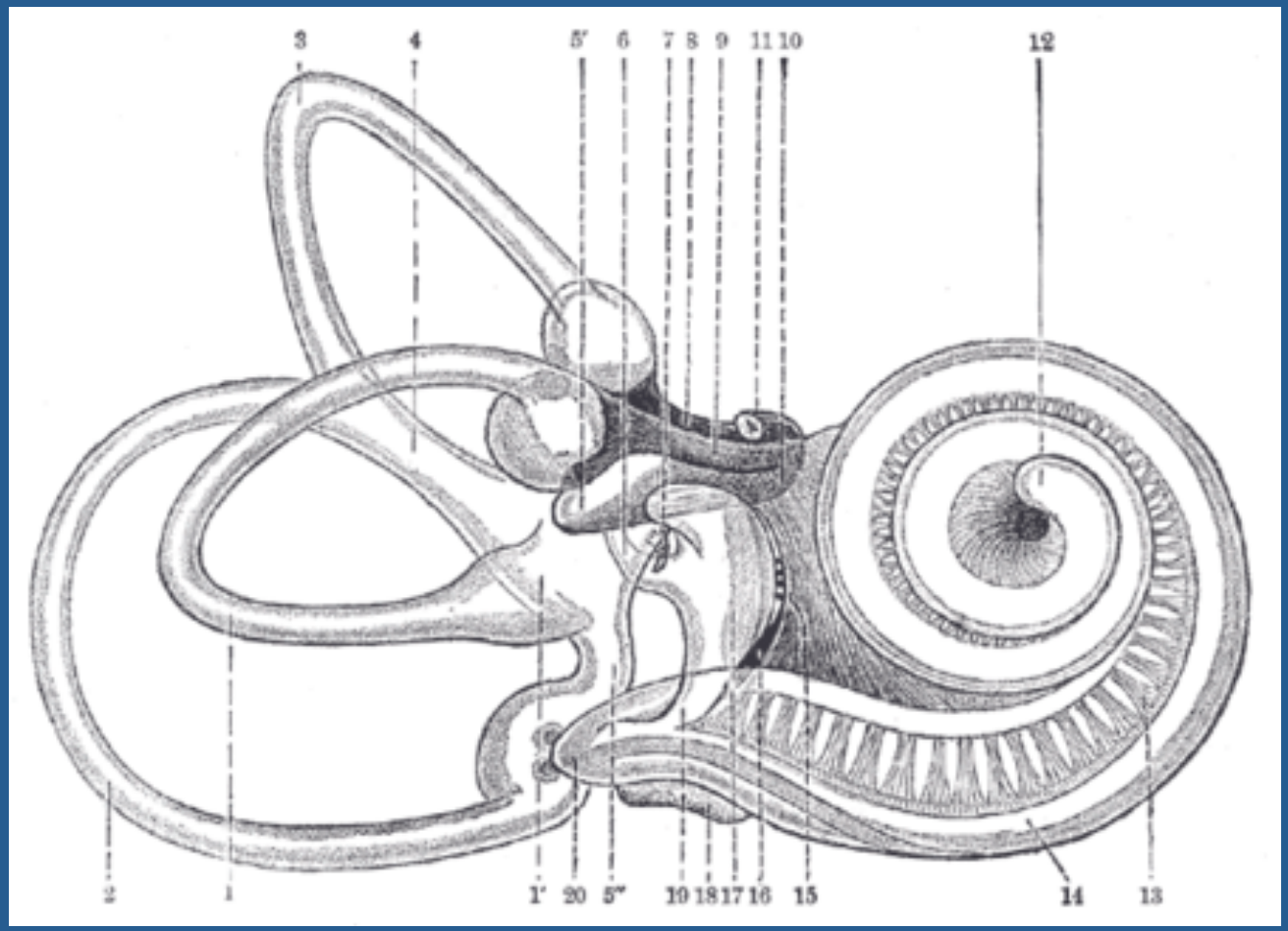
HINTS

- Head Impulse Test
  - Abnormal = peripheral
- Nystagmus
  - Unidirectional = peripheral
  - Direction-changing = central
- Test of Skew
  - Skew deviation = central
- https://youtu.be/1q-VTKPweuk

Patient #4: Exam

- Left beating nystagmus in left-gaze only
- Positive head thrust test to the right

Gentamycin Toxicity



Summary

- High yield screening exam
- Hypothesis driven approach to:
  - Suspected focal brain lesion
  - Altered mental status
  - Suspected spinal cord lesion
  - Vertigo

Bonus Case

- A 32 y/o woman presents with tingling in the hands and feet that progressed to diffuse weakness in the arms and legs over four days. She is now so weak she can no longer sit up.

Diffuse Weakness

Suspected localization

- High spinal cord
- Neuropathy
- Neuromuscular junction
- Myopathy

Other potential presenting symptoms

- Diplopia
- Dysarthria
- Dysphagia
- Respiratory failure

Localization of Weakness

	Pattern of weakness	Tone	Bulk	Reflexes	Sensory Loss	Other
Upper Motor Neuron	Pyramidal	Spastic	Normal	Increased	Varies	
Anterior Horn Cell	Pyramidal or myotomal	Spastic or normal	Atrophy	Increased or decreased	None	Fascic-ulations
Peripheral Nerve	In distribution of root or nerve	Normal or reduced	Atrophy	Decreased	Prominent	
Neuro-muscular Junction	Diffuse	Normal	Normal	Normal (myasthenia) or Absent (botulism)	None	Ptosis and ophthalmo-paresis
Muscle	Proximal > Distal	Normal	Normal or patterned atrophy	Normal	None	

Bonus Case

- Diffuse weakness throughout both arms and legs in both flexors and extensors
- No sensory level
- Decreased pinprick sensation in the feet
- Diffusely absent reflexes

Next Step?

- Lumbar puncture:
  - Protein 143
  - WBC 2
- Guillain-Barre Syndrome

Acknowledgements

- Hooman Kamel
- Andy Josephson
- Dan Lowenstein
- Ann Poncelet
- Kamel et al, A randomized trial of hypothesis-driven vs screening neurologic examination. Neurology Oct 2011, 77(14) 1395-1401.