Objectives

1. Describe the core elements of the neurology exam
2. List clinical pearls of the neuro exam

Neurology Exam

- General Physical Exam
- Mental Status
- Cranial Nerves
- Motor Exam
- Reflex Examination
- Sensory Exam
- Coordination
- Gait and Station
General Systemic Physical Exam

Head
• Trauma
• Dysmorphism

Neck
• Tone
• Thyromegaly
• Bruits

General Systemic Physical Exam

- Cardiovascular
  • Heart rate, rhythm, murmur; peripheral pulses, JVD
- Pulmonary
  • Breathing pattern, cyanosis, Mallampati airway
- General Appearance
  • Hygiene, grooming, weight (signs of self neglect)
- Funduscopic Exam

Mental Status

Level of Consciousness
• Awake
• Drowsy
• Somnolent
• Comatose
### Orientation & Attention

- **Orientation**
  - **Time**
  - **Place**
  - **Person**

### Orientation & Attention

- **Attention**
  - Digit Span—have the patient repeat a series of numbers, start with 3 or 4 in a series and increase until the patient makes several mistakes.
  - Then explain that you want the numbers backwards.
  - Normal—seven forward, five backward

  Hint: use parts of telephone numbers you know

### Memory

- **Immediate recall and attention**
  - Tell the patient you want him to remember a name and address
    - Jim Green
    - 20 Woodlawn Road, Chicago
  - Note how many errors are made in repeating it and how many times you have to repeat it before it is repeated correctly.
  - Normal: Immediate registration
Memory

- Short-term memory
  - About 5 minutes after asking the patient to remember the name and address, ask him to repeat it.
- Long-term memory
  - Test factual knowledge
    - Dates of WWII
    - Name a president who was shot dead

Memory

- Mini-Mental State Exam
  - 30 items
- Mini-Cog
  - Rapid Screen for Cognitive Impairment
  - A Composite of 3 item recall and clock drawing
  - Takes about 5 minutes to administer

Mini-Cog

![Mini-Cog Diagram]

- Recall 0
  - Abnormal
    - Demented
  - Normal Clock
    - Non-demented
- Recall 1-2
- Recall 3
  - Normal
  - Non-demented
Memory

- Visuospatial Skills
  - Clock drawing, figure copying
- Judgment
  - Insight, thought content
- Mood
  - anxiety, depression, manic, labile mood, flat affect

Language

- Naming
- Repetition
- Spontaneous Speech
- Comprehension

Language

- Dysarthria
  - Generic term that applies to motor speech disorders that reflect muscular weakness, incoordination, slowness, excess or variable speed of movement of muscles of respiration, phonation or articulation.
  - Dysarthria is a defect of the physiology of motor speech
### Language

- Prosody
- Loquacious
- Circuitous
- Soft, monotone speech

### Cranial Nerves

- **I Olfactory**
  - Sense of smell in each nostril
  - Causes of Anosmia of both nostrils
    - Blocked nasal passages, trauma, relative loss with aging, Parkinson's disease
  - Unilateral Anosmia
    - Blocked nostril, unilateral frontal lesion (rare)

- **II Optic**
  - Visual acuity
  - Visual Fields
  - Defects in Color vision
  - Afferent Pupillary Defect—swinging flashlight test

- **III Oculomotor**
  - Pupillary Response
  - Moves eyes
  - Elevates upper lid
Cranial Nerves

- IV Trochlear
  - Moves eyes downward and inward (superior oblique)
- VI Abducens
  - Abducts the eyes (lateral rectus)
- V Trigeminal (3 Divisions)
  - Feels touch, pain and temperature
  - Mastication
  - Corneal reflex

Cranial Nerves

- VII Facial
  - Closes eyelids, muscles of facial expression, nasolabial folds
  - Facial asymmetry
    - Bell’s palsy LMN
    - Bell’s Phenomenon
    - Stroke

Cranial Nerves

- VIII Acoustic
  - AUDITORY (Cochlear Branch)
    - Rub your fingers together, if one side is reduced; perform Weber & Rinne’s tests
    - 516 Hz Tuning Fork
    - Weber Test—ask which ear it is louder in
    - Conductive deafness→ deaf ear
    - Sensorineural deafness→ good ear
Cranial Nerves

- VIII Acoustic
  - AUDITORY (Cochlear Branch)
  - Rinne Test in Deaf Ear
    - Conductive Deafness BC>AC
    - Sensorineural Deafness AC>BC

Cranial Nerves

VIII Vestibular

- Gait
- Nystagmus
- Caloric test

Cranial Nerves

IX Glossopharyngeal

- Moves pharyngeal muscles
- Secretes saliva
- Sensory posterior 1/3 tongue, pharynx and middle ear

X Vagus

- Muscles of Palate, Pharynx and larynx
Cranial Nerves

IX Spinal Accessory
  Sternocleidomastoid Muscles
  Trapezius

XII Hypoglossal
  Moves Tongue

Motor Exam

Strength
  Upper and Lower Extremities
  Pronator Drift
  Bulk & Tone
  Abnormal Movements

Motor Exam

- Strength (0-5) Scale
  - 0  No movement
  - 1  Flicker
  - 2  Moves with gravity eliminated
  - 3  Moves against gravity, but no resistance
  - 4  Slight movement against resistance
  - 4+ Moderate movement against resistance
  - 4+ Submaximal movement against resistance
  - 5  Normal Power
**Motor Exam**

- Functional Weakness
  - The weakness is not in a distribution that can be understood on an anatomical basis
  - When there are no changes in reflex or tone
  - The movements are very variable and power erratic
  - There is a difference between apparent power of moving a limb voluntarily and when power is being tested

**Motor Exam- Upper Extremities**

- Deltoids/Biceps C5
- Wrist Extensors C6
- Triceps C7
- Hand Intrinsic, finger flexors C8

**Motor Exam- Lower Extremities**

- Hip Flexion (psoas) L1-L2
- Hip Abductors (gluteus med & min) L4-L5
- Hip Adductors (adductors) L2-L3
- Knee Extension (quads) L3-L4
- Knee Flexion (hamstrings) L5-S1
- Ankle Dorsiflexion (tibialis ant) L4-L5
- Ankle Plantarflexion (gastrocnemius) S1
- Foot Inversion (tibialis post) L4-L5
- Foot Eversion (Peroneus Longus & brevis) L5-S1
- Big Toe Extension (EHL) L5
Motor Exam

- Pronator Drift
- Bulk & Tone
  - Look for wasting
  - Compare the right and left sides
- Cogwheeling, flaccidity, spasticity
- Abnormal Movements
  - Tremor, tic, dystonia, chorea, myoclonia, asterixis

Motor Exam - Tremor

Reflex Examination

Reflexes (0-4)
0  No response
1+ Minimal or diminished response
2+ Average or Normal
3+ More brisk than average; may be normal for that patient or indicative of disease
4+ Very brisk, hyperactive, muscle undergoes repeated contractions or clonus; often indicative of disease

Jendrassik Manuever
Reflexes

- C5 Biceps
- C6 Brachioradialis
- C7 Triceps
- L4 Patellar
- S1 Achilles

Pathological Reflexes

- Grasp Reflex: Palmar stimulation results in a grasp reflex (dementia, bifrontal brain impairment)
- Snout Reflex: Puckering of lips in response to gentle percussion in the oral region (dementia, bifrontal brain impairment)
- Sucking Reflex: Sucking movements of lips in response to stimulating lips, tongue or palate (dementia, bifrontal brain impairment)
- Rooting Reflex: Stimulation of lips results in head deviating to direction of stimuli (dementia, bifrontal brain impairment)

Pathological Reflexes

- Palpomental Reflex: Ipsilateral contraction of the chin following scratching stimulation of the thenar area (palm) of the hand. (May be found in unaffected people, but common in dementia)
- Glabellar Reflex (Myerson's sign) Blinking of the eyes each time the area between the eyes is tapped. Normally, the patient blinks only the first few times tapping is initiated. (parkinsonism)
Pathological Reflexes

- Babinski's Reflex Stimulation of the plantar surface of the foot with a moderately sharp object, (from heel to toe along the lateral aspect), is followed by dorsiflexion of the toes, especially the great toe, and separation or fanning of the toes. (positive Babinski is related to disease of the cortical spinal tract at any level from the motor cortex through the descending pathways.
- Hoffman's sign
- Clonus

Sensory

- 5 Modalities
  - Light touch  Posterior columns
  - Vibration  Posterior columns
  - Proprioception  Posterior columns
  - Pinprick  Spinothalamic tract
  - Temperature  Spinothalamic tract
  - Use 128 Hz tuning fork

- Graphesthesia
- Stereogenesis
- DSS
- Two point discrimination
### Cerebellum

- **Finger to Nose Test**
  - Patient can complete quickly and accurately—Normal
  - Pt develops a tremor as his finger approaches the target
    - Intention tremor
- **Repeated Movements**
  - Disorganization of the movements of the hands and elbows, taking wider excursions than expected
    - Cerebellar incoordination
  - Disorganization of the tapping the hand, then turning it over
    - Dysdiadochokinesia
- **Heel-Shin**

### Gait & Station

- Can they get out of the chair with their arms crossed?
- Station: narrow vs wide
- Posture: straight or stooped
- Stride: Short, shuffling
- Festinating gait
- Heel, toe and tandem
- Arm swing: Present or absent
- Steppage gait: Foot drop
- Scissoring gait: Spastic paraparesis

### Gait & Station

- Hemiplegic: Stroke, MS
- Gait Apraxia: usually with frontal lobe pathology, NPH, Stroke, Dementia
- Functional Gait: variable, may be inconsistent with the rest of the exam, worse when watched.
- Romberg: ONLY positive if the patient falls, or if you have to catch them to keep from falling
  - Can occur with posterior column lesion in spinal cord, B12 deficiency, tabes dorsalis, degenerative spinal cord disease, peripheral neuropathy
- Retropulsion
- Non-neurological Gaits: Antalgic
**Headaches**

**FACT OR FICTION**

There are two kinds of headaches: migraines and non-migraines

**Headaches**

**FACT OR FICTION**

Headache medication can cause headaches

**Headaches**

- Migraine
- Muscle Tension headache
- Analgesic Over Use Headache
- Red Flags
### Headaches-Migraine

- 28 million Americans suffer from disabling headaches
- 17% of women have migraines
- 8% of men have migraines
- Diagnosis is made based on the headache’s characteristics and associated symptoms

### Migraine headache

- Common Migraine
  - No aura
- Classical Migraine
  - With Aura
  Focal neurologic symptoms that precede, accompany or rarely follow an attack.

### Migraine Auras

- Develops over 5-20 minutes
- Lasts less than 60 minutes
- Can involve visual, sensorimotor, language or brainstem disturbance.
- Most common is visual
**Migraine Characteristics**

- Unilateral
- Throbbing or pulsating
- Aggravated by activity
- Photophobia
- Phonophobia
- Osmophobia
- Nausea and +/- Vomiting

**Other Types of Migraines**

- **Complicated Migraine**
  - Attacks with major neuro deficit, which can outlasts the headache by 1-2 days
  - Ophthalmoplegic and Basilar, generally in childhood; accompanied by occipital lobe or brainstem signs:
    - Diplopia, Bilateral VF abnormalities, Ataxia, Dysarthria, CN abnormalities, Sensory and motor impairments

**Migraine Headaches Triggers**

- Hormonal changes
- Foods
- Stress
Migraine Headaches Triggers

- Sensory Stimulus
- Physical Factors
- Changes in Environment
- Medications

Migraine Treatment

- Abortive Therapy
  - Acetaminophen, NSAIDS, Triptans, antiemetics
  - Opiods are of limited use
- Prevention
  - Beta Blockers
  - TCAs
  - Calcium Channel Blockers
  - Anticonvulsants

Cluster Headache

- Affects less than 1% of the population
- Five times more common in men
- One of the most painful types of headaches
Cluster Headache

Signs and Symptoms

- Sharp, burning, and penetrating pain
- Restlessness
- Teary eye and stuffed nose
- Red, flushed face
- Swelling around the eye on the affected side
- Reduced pupil size
- Drooping eyelid

Cluster Period Characteristics

- Generally last from two to twelve weeks
- Seasonal
- During a cluster, headaches occur daily
- A single attack can last 45 to 90 minutes
- Clock-like regularity
- Episodic or Chronic

Causes of Cluster Headaches

- Alcohol
- Cigarettes
- Sleep apnea
- Disruption of normal sleep patterns
- Increased sensitivity of nerve pathways
### Treatment of Cluster Headaches

- There is NO cure
- Oxygen
- Medications
- Long Term Prevention

### Tension Headache

- Most Common Type of Headache
- The exact cause is unknown
- Some researchers hypothesize that these headaches are due to chemical changes

### Characteristics

- Tension in the scalp, neck, and shoulder muscles
- Difficulty sleeping
- Fatigue
- Irritability
- Loss of appetite
- Difficulty concentrating
Triggers / Aggravators

- Stress
- Depression and anxiety
- Lack of sleep or changes in sleep
- Skipping meals
- Poor posture
- Working in awkward positions or holding one position for a long period of time

Triggers / Aggravators

- Occasionally, hormone changes related to menstruation, pregnancy, menopause, or hormone replacement therapy
- Medications to treat other conditions such as depression or hypertension
- Overuse of headache medications

Treatment of Tension Type Headaches

- Acute Therapy:
  - Over the counter medication
  - Prescription medication
Prevention of Tension Type Headaches

- Preventative Medications
  - TCA
  - Anticonvulsants
  - Tizanidine
- Lifestyle changes
- Physical Therapy

Lifestyle Changes and Self-Care

- Healthy lifestyle
- Stress management
- Regular exercise
- Muscle relaxation
- Good posture
- Complementary and alternative medicine

Rebound Headaches

- "Medication Overuse Headaches"
- Pain relievers offer quick relief for occasional headaches
- THERE IS A LIMIT!!!
Characteristics

- Occur daily
- Can awaken you in the morning and continue throughout the day
- Can be dull, achy, throbbing, or pounding

Treatment

- It will get worse before it gets better
- Break the cycle

RED FLAGS

- Headache that begins after Age 50
  - Temporal arteritis, mass lesion
- Sudden Onset Headache
  - SAH, bleed in to a mass or AVM
  - "worst headache of my life"
- Accelerating Pattern of Headaches
  - Mass lesion, SDH, Medication Overuse
### RED FLAGS

<table>
<thead>
<tr>
<th>New Onset HA in patient with Cancer or HIV</th>
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<tbody>
<tr>
<td>Meningitis, abscess, mets</td>
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<tr>
<td>Headache with systemic illness (fever, rash, stiff neck)</td>
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<tr>
<td>Meningitis, encephalitis, Lyme, systemic infection</td>
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<tr>
<td>Brudzinski’s (hips flex with chin on chest)</td>
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<td>Kernig’s (neck pain when knee extended with hips flexed)</td>
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<th>Focal Neurological Symptoms</th>
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<tr>
<td>Mass lesion, AVM, Stroke</td>
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<table>
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<tr>
<th>Papilloedema</th>
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<tr>
<td>Mass lesion, pseudotumor, meningitis</td>
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### Dizziness

<table>
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<tr>
<th>Nonspecific term</th>
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<tbody>
<tr>
<td>Vertigo (rotational sensation)</td>
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<tr>
<td>Syncope</td>
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<tr>
<td>Light headed</td>
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<tr>
<td>Impending fainting sensation</td>
</tr>
<tr>
<td>Dimming of Vision</td>
</tr>
<tr>
<td>Disequilibrium</td>
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Vestibular Disorders

- Vertigo is a symptom
- Nystagmus is a sign
  - If the vertigo is peripheral, nystagmus is present
  - At the time of the exam, if the patient is c/o vertigo, but no nystagmus is seen consider a central origin

Peripheral Vertigo

- Vertigo is accompanied by nausea and vomiting
- Vestibular Neuronitis
  - Repetitive attacks of Peripheral Vertigo without auditory dysfunction
- Labryinthitis
  - Severe vertigo without autonomic sx, accompanied by otitis or viremia

Peripheral Vertigo

- BPPV
  - Confirmed when symptom of vertigo and horizontal nystagmus are reproduced by Nylen-Barany or Dix-Hallpike Maneuver
  - Caused by debris (otoliths) in the semicircular canals
  - Is turning over in bed in a certain direction a trigger?
  - Liberatory (Epley) maneuver
Peripheral Vertigo

Other Causes
- Meniere's Disease
- Acoustic Neuroma

Treatment
- Meclizine 12.5-25mg every 6 hours

Central Vertigo

VBI
- Cerebral ischemia producing vertigo is in the vertebral basilar distribution, therefore; carotid ultrasound is NOT indicated
- Sudden Onset of dizziness with vomiting, disequilibrium and truncal ataxia is commonly seen with cerebellar hemorrhage or infarction

Central Vertigo
Wallenberg Syndrome

Vertigo is often seen with infarction in the lateral brainstem

Associated signs:
- Ipsilateral face pain
- Diplopia, Dysphagia, Dysphonia
Central Vertigo
Wallenberg Syndrome

- Exam:
  - Horner's Syndrome
  - Decreased sensation on the same side of the face
  - Sensory loss on the OPPOSITE side of the body
  - Nystagmus

Neuroimaging

- CT Scan
  - Blood
  - Bone
  - Hardware
  - Quicker to complete
  - Availability
  - Claustrophobia
  - MRI Contraindicated
    - Pacer, metal

- MRI Scan
  - MS
  - Stroke (DWI)
  - Tumor
  - More detail of Brain
  - NPH
  - Dural Sinus Thrombosis
  - Chiari Malformation
  - Venous Infarction Post partum