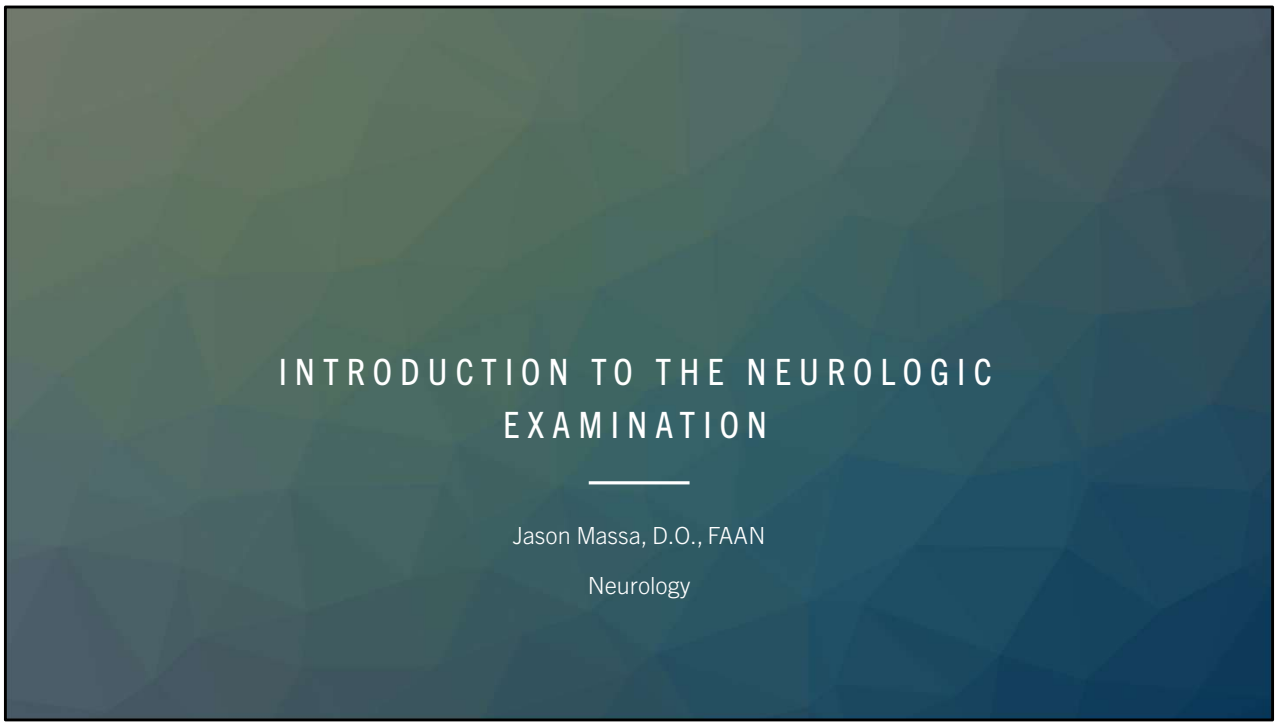


will go over bsa components and form own neuro exam for clinical settings

LEARNING OBJECTIVES

- Develop a screening neurologic examination suitable for use in a primary care setting
- Understand normal findings and their variations from this exam
- Recognize common abnormal findings and their significance
- Apply the results of a screening neurologic examination to the workup of a patient's complaints

OVERVIEW

- The neurologic exam is one of the most detailed physical examinations still in use today
- There is no such thing as a 'complete neurologic exam.'
  - Each patient examined as an individual - exam tailored to information obtained from history
  - With an abundance of available examination techniques, neurological examinations must strike a balance between focus and breadth
- We will discuss many techniques today, but keep in mind that a *screening neurologic examination* does not usually include all of these techniques.

Many other elements of the general physical examination have been supplanted by more sensitive and specific pieces of technology (stethoscope often replaced with ultrasound, etc)

a lot of the physical exam has been supplanted by tech but not true in neuro - give clues to localization (why it remains benchmark to physical exam)

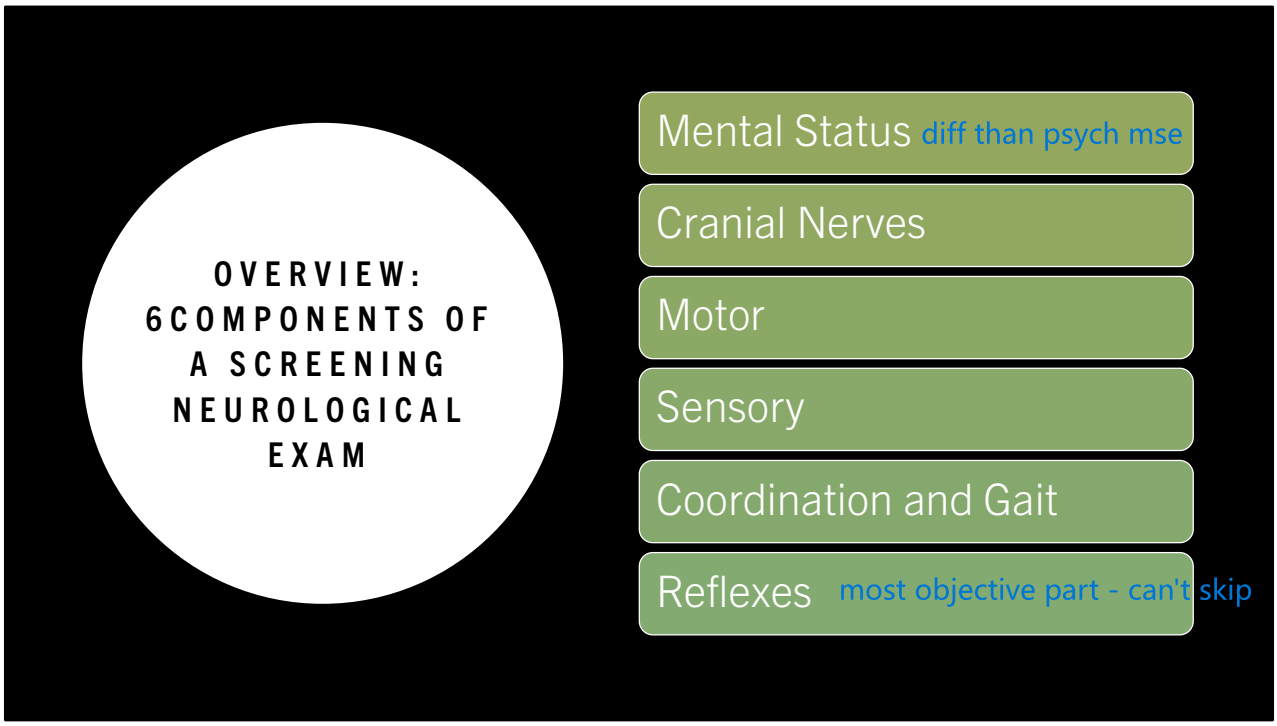
should not be doing everything on every patient - neuro exam is a bespoke design for every patient for chief complaint

stroke - time is brain could do MSE but extra time is more time of ischemia so setting will tell you what k exam to use

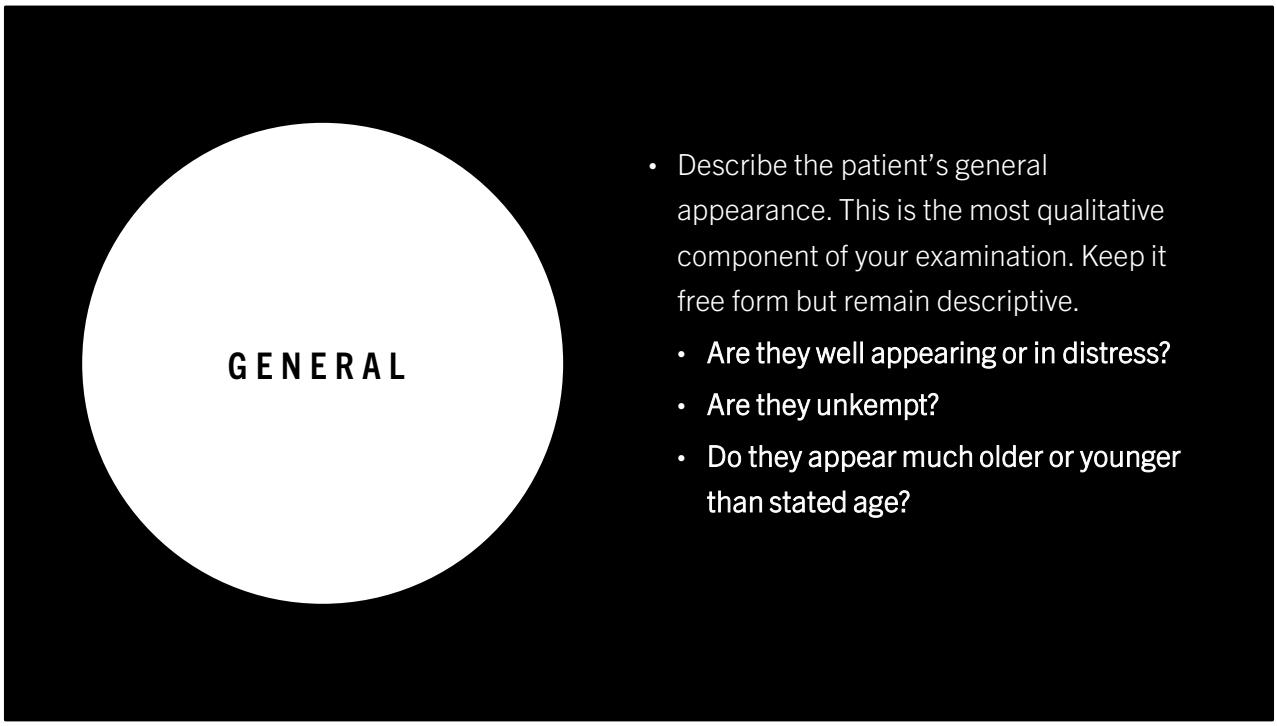
A WORD ON HISTORY TAKING

- There is no substitute for a thorough history
- Your medical knowledge will drive your history taking skills, while you wait to acquire this you can rely on OLCARTS
- As you glean information from the interview, you will decide how to best examine the patient for their given complaint
- For instance, in the setting of an acute stroke you would do an abbreviated assessment and, in an office setting, for a slowly progressive disease you may include more specialized testing.

still need a solid history - cannot take a good physical exam without it
MK/experience will help you take a good history
take extra exhaustive history before you can start skipping components - comes with exp



throwaway triangle reflex hammer



up to you on how to describe
classics: unkempt, old/younger than stated age, well appearing or in distress

MENTAL STATUS: LEVEL OF CONSCIOUSNESS

- Ranges from alert (normal) to coma
  - Alert – awake and interactive
  - Obtundation – patient is not alert, with lessened interest in the environment.
    - The level of impairment is mild-moderate, with more tendency towards sleep and drowsiness in between.
  - Stupor – patient is severely impaired, asleep by default.
    - Like sleep, except patient can't be fully aroused by all but intense stimulation, and even then, often does not fully awaken.
  - Coma – unarousable unconsciousness. Eyes are closed. May make only reflexive movements.
    - Distinct from sleep, not to be thought of as ultra-deep sleep.

There is variability in the terms used by different clinicians when it comes to the levels in between: stupor, lethargic, drowsy, and obtunded. It is best to avoid the words 'lethargic' and 'drowsy' as their technical definitions are not as widely accepted.

many words to describe
best attempt at standardization is these 4 terms

coma - reflex
hand drop test: lift hand above head and see if it lands on their head
sternal rub: patient in a true coma should have no response
painful stimuli to appendages: take something metal and push on edge of nail bed
may see triple flexion - reflexive mvmt in comas

obtundent - generally awake but tired (in lecture and falling asleep), can be oriented

stupor - asleep by default only wake up by stimulation and go to sleep quickly

A&O:
A - alert
O - orientation where in time, space (name, where are you, date, why are you here, how did you get here) - j situational awareness

who are you, what's your name - rarely a neuro prob usually a psych prob

MENTAL STATUS: ORIENTATION

- Refers to the patient's understanding of where they are in time and space. Commonly reported as 'oriented x 4' – person, place, time, and situation
  - Where are you?
  - Who are you?
  - What is the date today?
  - Who is the president?
  - Why are you here? (Situational orientation)

MENTAL STATUS: LANGUAGE

- Used to assess aphasia - focused on cognitive aspects of speech as opposed to motor components
  - *Naming* – ask patient to name a few objects in the room
  - *Repetition* – ask patient to repeat a phrase.
    - I usually use 'today is a sunny day.'
  - *Comprehension* – usually indirectly assessed through interaction with patient. When directly assessing comprehension, ask patient to follow simple and multi-step commands such as:
    - Close your eyes (midline command)
    - Raise your arms (appendicular command)
    - Take this piece of paper with your left hand, fold it in half, and place it on the ground (multi-step command)
  - *Fluency* – also indirectly assessed, looking for stuttering, word-finding difficulty, and/or paraphasic errors.

looking for hearing, processing, and repeating

depends on level of conciousness

or smile

sometimes naming difficulties - loss of fluency but can still name

cognitive components of language: production and reception not so much the motor production (slurred speech)

sematic paraphrasic: swapping similar words
phonemic paraphasic errors: - swapping similar sounds

MENTAL STATUS: SPEECH

- Assess quality of speech - motor components of speech
  - *Dysarthria* – commonly referred to a slurred speech (multiple types beyond the scope of the screening exam)
  - *Prosody* – rhythm of speech. Some patients with cerebellar disorders can take on a monotonous rhythm called 'scanning dysarthria'
  - *Volume* – patients with hypokinetic disorders such as parkinsonism frequently develop hypophonia, where their speech becomes soft and quiet, worsening as they go

    will start loud and good and will taper off

cerebellar prob - monotonous speech = loss of prosody

CRANIAL NERVE I: OLFACTORY NERVE

- Not frequently tested.
- Use non-noxious stimuli such as coffee, lite perfumes, citrus.
  - Noxious stimuli like alcohol or solvents may cause false negative finding of intact sense of smell.
- A standardized, reliable, and validated test is called the University of Pennsylvania Smell Identification Test - utilizes scratch-n-sniff spots.
  - Not used in routine clinical practice.
- Deficits of CNI are referred to as 'anosmia' or 'hyposmia,' meaning total loss of smell and reduced loss of smell respectively.
  - Can be seen in head injury, neurodegenerative diseases such as Parkinson's, and more recently recognized as common symptom of SARS-COV-2 infection.

expensive and no reason to administer it - doesn't make a clinical diff

don't usually test in practice

noxious smells can still bother people with complete anosmia

head injury - all the fibers coming through cribriform are susceptible to she
PD - loss of sense of smell often before motor symptoms
SARS-COV-2 - down regulation of sensory receptors more so than a regula

CRANIAL NERVE II: OPTIC NERVE

- Visual Fields - For screening both eyes tested together, but if vision complaint test individually.
  - Stand 2-3 feet away from patient - ask patient to look at your nose. Hold your hands up equidistant between you and patient, ask them to tell you number of fingers you are holding up in each of the four quadrants of vision.
- Fundoscopic exam – covered by Dr. Feinberg. Briefly, using a direct ophthalmoscope look at the retina, optic disc, macula, and vasculature. Look for disc edema – papilledema or true optic disc edema.
  - Papilledema: swelling of the nerve fiber layer due to elevated intracranial pressure.
  - Other types of disc edema: inflammation from optic neuritis, infiltrative diseases, ischemic/vascular disease, etc
  - Disc atrophy also seen as a consequence of old optic nerve lesion
- Not pupils – while CNII is the first arm of the reflex arc, the pupil examination is grouped with CNIII as it is controlled by sympathetic and parasympathetic fibers running with CNIII.

only opportunity to look at CNS
perception - VF: screening can just do L/F or if needed 4 quadrants (L/R/upper/lower)
retina is diff
have them cover one eye and check the fields in each eye - if fields missing the same suggests a retrochiasm only in one is more forward

panoptic scope is fancier

papilledema - swelling of nerve due to increased intracranial pressure
optic disc edema - optic neuritis but distinct from papilledema

pupil is partially CN II but is first part of pathway

CRANIAL NERVES III, IV, VI: OCULOMOTOR NERVE, TROCHLEAR NERVE, & ABDUCENS NERVE

- Pupils – should be roughly equal in size (within 1mm.) and round. Assess for reactivity to light both directly and indirectly.
- Accommodation – refers to the 'accommodation reflex' which includes pupil constriction, lens accommodation, and convergence of the eyes.
  - Tested by slowly bringing your finger towards patients nose while having them focus on it. You can observe pupils constricting and eyes converging but you cannot directly observe accommodation.
- Extraocular movements – should be tested individually when indicated, but for screening purposes both eyes can be tested together.
  - Move your finger slowly in an H pattern, or better in a six-speed pattern. Observe for any disconjugate movements and ask about complaints of double vision.

not a per eye basis - if shine a light in one should also get constriction in other eye

two patterns: cardinal mvmts of eye in isolation (H test), brain side straight up and down

4 directions and all corners

accommodation: change in shape of lens to focus on a near object but eyes also converge and pupils constrict (like aperture on camera get greater depth with narrower)

CRANIAL NERVES III, IV, VI CONT...

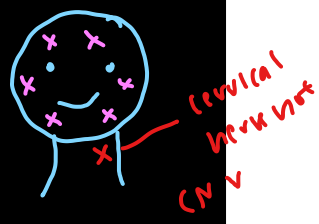
vestibular of peripheral or central etiology

- Nystagmus – quick, involuntary movements with fast phase in one directly and slow phase in the opposite direction. slow drift with a quick correction
  - Some small amount of end-gaze nystagmus (a few beats,) is normal in the extreme lateral eye movements.
  - Up or down-gaze nystagmus is always localizes to the CNS, whereas other types of nystagmus can be due to CNS or PNS localizations. Vertigo - brain thinks we're moving around and trying to keep eyes stable
- Saccades – quick, voluntary eye movements.
  - Test by holding index fingers and ask patient to quickly move their eyes between the two targets. Do this horizontally and vertically. keep them kind of close
  - Deficits of vertical saccade movements with preserved horizontal saccades is indicative of a mid-brain lesion.

diff than smooth pursuit - following something with eyes

consider it to be localized to CNS until proven otherwise but not exclusively CNS

CRANIAL NERVE V: TRIGEMINAL NERVE



- Tests facial sensation
- Light touch in V1, V2, and V3 distributions on both sides.
  - **Deficits of CNV do not usually manifest with pure midline splitting, and a finding of such can indicate a non-organic etiology of a patients complaint.**
- A jaw jerk (tapping on a half-way relaxed, opened jaw at the chin,) can be tested, but is usually included in the reflex examination section.
- Other aspects of CNV are not routinely tested such as jaw proprioception or muscles of mastication weakness as they lack localizing value.

midline splitting usually not organic

CRANIAL NERVE VII: FACIAL NERVE

- Evaluates Facial Strength
- Ask patient to:
  - Raise their eye brows
  - Close the eyes strongly, as if they got soap in the eyes. You can check eye opening resistance with this.
  - Smile largely, show teeth.
  - Add in taste sensation with a lemon stick (available in hospitals)
  - Check for hyperacusis with finger rub in each ear, or with tuning fork.
    - Patients with true hyperacusis will move away from tuning fork rapidly, be sure to have the bedrails up.

anterior 2/3 taste, test on both sides

muscle dampens sound - if lose tone in hyperacusis will jump off bed bc so loud

always test both sides if testing eye closure strength

nasal labial fold at rest - can be a sign of subtle facial weakness
stroke/bell's palsy

ask family/use license photo

bell's palsy often has loss of taste on one side

CRANIAL NERVE VIII: VESTIBULOCOCHLEAR NERVE

- Screening for hearing loss: Rub your fingers lightly by each ear
  - Ask patient if they can hear it and if it is equal on both sides
- To differentiate between sensorineural from conduction hearing loss:
  - Rinne test: compare each ear with 512 hz tuning fork for both air conduction and bone conduction.
    - Air conduction: hold the ringing tuning fork by each ear.
    - Bone conduction: placing bottom of tuning fork on mastoid process.
    - A normal test is Air > bone conduction.
- Weber test for localization. Performed by placing ringing tuning fork on forehead or bridge of nose. Ask patient if sound is equal in both ears.

big - 128Hz lower pitch for vibration
little - 512 Hz for hearing

Weber test: hit tuning fork against something then put on top of head in middle and ask patient if hear it in middle/left/right

Rinne: air conduction includes bone conduction
hear by ear and hear when put on bone (mastoid)
if only on bone some part of air conduction isn't working

CRANIAL NERVE IX & X: GLOSSOPHARYNGEAL NERVE & VAGUS NERVE

- Uvula and soft palate assessment
  - Uvula should be midline
  - Soft palate should have a roughly equal arch on each side.

pt open mouth and look at mouth may or may not need a tongue depressor saying ahhh will further raise the palate - soft palate has arch shape and uvula is drop in middle has muscles that suspend it if nerves not working correctly arch will drop
palate collapsed: indicates weakness of muscle not necessarily damage to nerve - could be contralateral motor cortex (do not same is damage to CN)
uvula is way to judge weak side - will deviate away from side that is weak

CRANIAL NERVE XI: SPINAL ACCESSORY NERVE

- Assess by having the patient shrug the shoulders.
- Observe for equal rise and for a lag.
- Can check strength by testing resistance.

traps and scm

traps weak on r will prob in r
scm turns the head - weak head turn to left has weakness on r

CRANIAL NERVE XII: HYPOGLOSSAL NERVE

- Have the patient protrude the tongue, observe if it deviates from midline.
  - It will deviate towards the weaker side.
- If assessing for tongue fasciculations, such as might be seen in ALS, check with the tongue relaxed in the mouth.

tongue protrusion is contraction - will deviate toward weak side
fascial weakness will make it look like the tongue is deviated - be careful in how you interpre
lobar involvement of ALS - tongue fasciculations will happen if you stick your tongue out just
patient open mouth and look at tongue for motor twitches

MOTOR EXAMINATION

- Tone – Have patient relax their extremities. Passively move the limb. feeling for resistance
  - Helpful to move in chaotic pattern so patient has difficulty anticipating direction of movement.
  - Axial tone tested by having patient relax their neck and passively tilt/turn/flex the head
- Strength - discussed elsewhere. Be sure to use a standard grading scale such as 0-5.
- Rapid alternating movements – Test of basal ganglia and cerebellar function.
  - Have patient tap thumb and index finger quickly, observing for maintenance of rhythm, speed, and amplitude.
  - Can be assessed with supination/pronation - open/close fist.
  - Irregularities of rhythm and speed can be signs of cerebellar dysfunction, while decrementing speed and amplitude localize to the basal ganglia.

stabilize above and below the joint you're testing, don't test a bunch of things at the same tim

grip strength: match patient hand with arm relaxed - can match fingers

tone (all passive patient for testing): notoriously difficult to get a feel for
if can't loosen limbs either tense or spasticity or parkinsonian rigidity
flaccid muscle tone was to assess in adults and hypotonia in infants

resistance in tone:
spasticity = UMN
low muscle tone = LMN

have them move contralateral limb - increases rigidity

RAM - extrapyramidal test (not strength anymore)
finger tapping - make an L and tap fingers fast and wide do one side at a time if there a subtle
then do both at same time
open close hands full and fast
pronation/supination

PD - will start full but will slow down - decrementing = bradykinesia
cerebellar prob - can do but will do in a disorganized fashion - more explicitly test with hand t
in pronation and supination (compound movements that need to be timed correctly)

SENSATION

- Individual modalities should be tested throughout.
- Light touch - Use cotton tip or your hands can use hands
- Temperature - Use metal object like your reflex hammer or tuning fork metal and cool
- Vibration - use 128hz tuning fork base, test at the great toe first before moving more proximally.
  - **Very mild distal vibration loss can be normal in advanced age.** big fork use base
- Proprioception - ask patient to close their eyes. Hold great toe at interphalangeal joint on lateral sides and move toe up and down. Ask patient to identify the direction of movement.
  - **Even small movements should be perceptible in a healthy adult. Take care to grip only lateral aspects of toe as pressure on plantar surface or nail bed can give away the direction of movement when proprioception is poor.**
- Romberg test - have patient stand in front of you with feet naturally distanced (don't ask them to put the feet together.) Assess the tendency to sway with eyes open and compare with eyes closed.
  - **A worsening sway with eyes closed is a positive test and indicates a deficit in proprioceptive pathways, called a sensory ataxia.**

opportunity to localized - particular prob with a specific modality

generally don't test vibration everywhere but if going to do it to tips of great toe but may have test everywhere for bsa

if loose proprioception can't walk most common is length dependent neuropathy start at toes
hold distal joint at lateral aspect and other hold the lateral aspect of toe - can you feel movement and what direction I moved it in?

don't grab top or bottom of toe bc pt can sense based on pressure
also pull toe away from other toes

if find it in toe check ankle

Romberg: also proprioception or sensory test not cerebellar - how well is proprioception working if remove vision
increase sensitivity by putting feet together if needed
will be right by patient to support if needed
increase in sway when close the eyes makes the test positive - testing the sensory arc of balance

cerebellum there to synchronize things is expressed as a coordination prob but prob likely from issues in sensory integration

COORDINATION:

- Finger-nose-finger - hold out your index finger and ask patient to touch their nose, then touch your finger. Keep your finger in the same place. Observe the accuracy of the end points and the pathway in between. Do not move your finger. Test both sides
- Heel to shin - have patient place their heel on the opposite shin, and move it quickly up and down the shin. Observe for accuracy of placement and ability to keep the heel on the shin during the movement. Test both sides.

finger-nose-finger - don't cross midline, don't move finger around (testing too many things), ha
have pt reach

heel on shin (eyes open): seated or supine don't do standing, have them do it quickly - looking
ability to keep heel on shin or chaotic mvmt

REFLEXES: muscle stretch reflex

- One of the most powerful tools in the neurologist's toolbelt. Provides localizing value to examination of weakness. Test of muscle stretch reflex, initiated by muscle spindle. Also called myotatic reflex or deep tendon reflexes
  - Biceps (C5/C6)
  - Triceps (C7)
  - Brachioradialis (C5/C6)
  - Patella (L2-L4)
  - Achilles (S1)
  - Optional - medial hamstring (L5)
- Babinski reflex: nociceptive reflex of the lower extremity. The bottom of the foot is stroked with moderate intensity, in a C-shape around the lateral aspects of the plantar surface.
  - Normal response: Down going - great toes curl down or flex.
  - Abnormal response: Upgoing - fanning out and upward movement of great toe.
    - Babies have upgoing toes between 6 months and 2 years, and it is perfectly normal.

can dorsiflex to add tension or if supine pt put hand on bottom of foot and hit your hand (can give impulse not directly on tendon)

context is key don't over examine babies

reflexes may be difficult if not confident in ability to get one - build confidence by checking it in standard - biceps, brachioradialis, triceps, patella, Achilles

hyperreflexic: check finger flex: pull grip and hit bottom on hand and get a jerk

spreading reflex - hit bicep and see at shoulder most often pathological

wide range of normal but asymmetries in clinic esp with complaint requires an explanation

Babinski - no socks!! (can get without but shouldn't)
supposed to be painful
painful stimulus to bottom of foot if toes go down = normal, toes go up = abnormal (UMN)

GAIT:

- Powerful assessment tool. Relies on many neurological systems working in coordination. Gait is both a voluntary and automatic movement.
- Important aspects of gait to include in your exam are:
  - Posture - upright, stooped, hyperextended
  - Stride length
  - Stance - normal width is 1 - 3 inches, widened can indicate cerebellar or proprioceptive dysfunction. Overly narrow gait can indicate spasticity in the lower extremities
  - Pace - neurodegenerative diseases like parkinson's disease can cause abnormalities of pace, where a patient may be very slow to start, have intermittent freezing, or festination (speeding up to catch up with a forwardly displaced center of gravity.)
  - Arm swing may be reduced, or take on abnormal twisting postures with dystonia

balance problem

freezing/shuffling ?

rigidity on one side will have reduced arm swing don't let a person holding a purs confuse you

ALWAYS walk patients if possible (walker, assistance, etc.)

hard to walk normal if someone tells you bc is subconcious movement

tell them to do a light jog/walking backwards will help them snap out of it - also a good way to test

GAIT CONTINUED

- A normal turn is a quick 1 - 2 step pivot. If a patient takes several steps to turn around, moving the whole body with each step, this is called 'en bloc' turning and is associated with parkinsonian disorders. en bloc - shuffling not turning with whole body = f
- Heel and toe walking are helpful for assessing plantar and dorsiflexion strength in the lower extremity strength test in L
- Asking a patient to run is an excellent challenge to gait which can reveal non-organic gait problems.
- Walking is an automatic movement which can sometimes be the only way to get someone to truly relax their upper extremities, revealing subtle involuntary movements or abnormal postures.

tandem walking = heel to toe walking normal to have more issues with advancing age