



—BELMAT—
HEALTHCARE TRAINING

Neurological Assessment

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Acknowledgement: Material also supplied by Sarah-Jane Lewis: Senior Lecturer

Session Aims and Objectives



Revise the anatomy and physiology of the nervous system



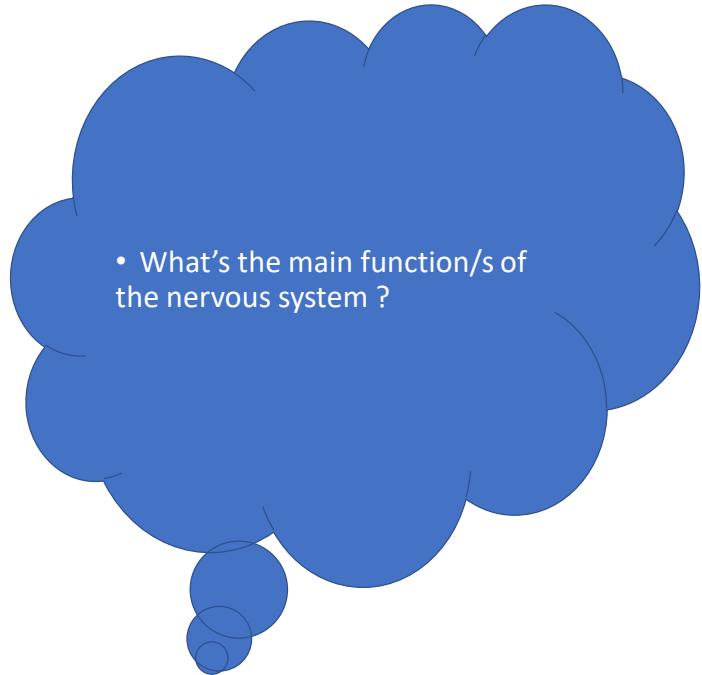
Consider relevant history



Neurological examination



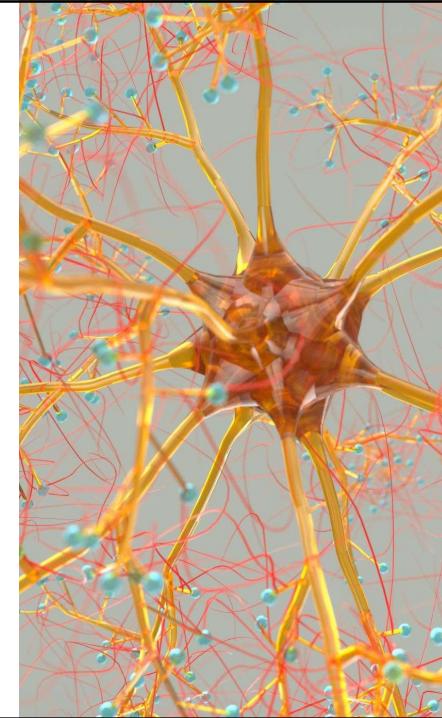
Red Flags

- 
- What's the main function/s of the nervous system ?

Nervous system

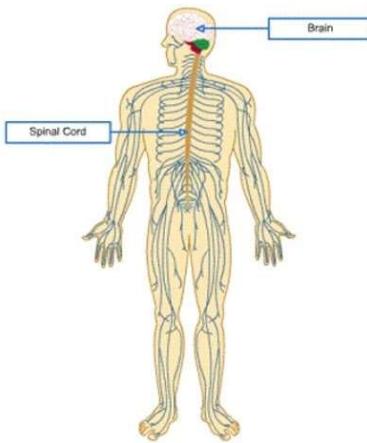
Function:

- Permits the body to react and adjust to changes in the environment and within the body.
- Sensing of stimuli and conveyance to the brain for analysis, comparison and coordination by the body.
- Conveyance of messages by the nerves to the glands and muscles for a response

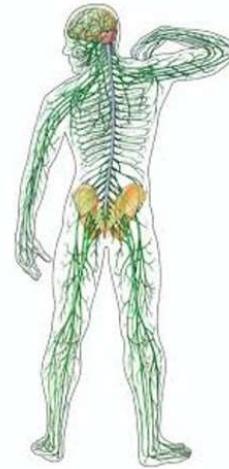


The Nervous System

Central Nervous System (CNS)



Peripheral Nervous System (PNS)



CNS

CNS – receives & interprets stimuli, then dispatches impulses to glands and muscles for appropriate actions.

Higher mental faculties = in the brain.

Automatic reflex actions = spinal cord.

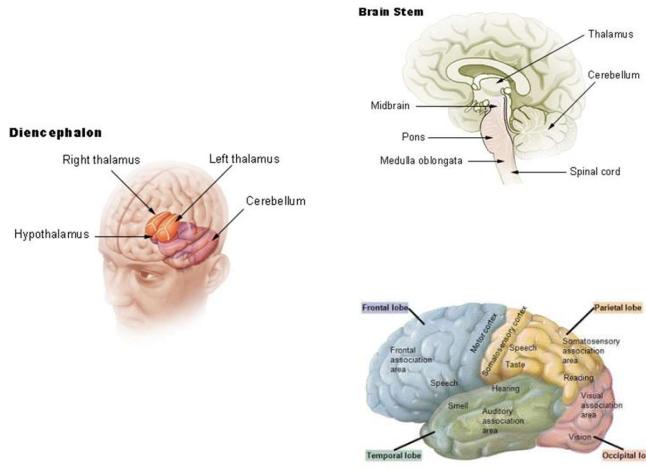
PNS

- PNS – lies outside of the CNS = allows the CNS to communicate with the rest of the body
- *12 pairs of cranial nerves, 31 pairs of spinal and peripheral nerves*

2 x divisions

- 1 = **SENSORY** – nerves carry impulses from the organs (VISCERAL SENSORY NERVES) and from the body surface (SOMATIC SENSORY NERVES)
- 2 = **MOTOR** – SOMATIC – CNS to skeletal muscle
- AUTONOMIC - Sympathetic (impulse to organs)
+ Parasympathetic (opposes sympathetic)

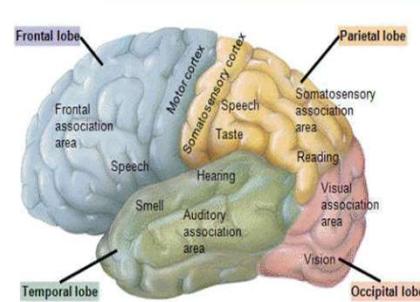
The Brain



- Cerebrum
- Diencephalon (Medulla)
 - Thalamus
 - Hypothalamus
 - Epithalamus
- Cerebellum
- Brain stem
 - Midbrain
 - Pons
 - Medulla Oblongata

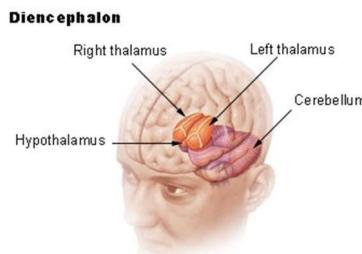
The Cerebrum

- Largest part of the brain and upper most region of the CNS
- 2 hemispheres
- Divided into 4 lobes
 - frontal, temporal, parietal, and occipital
- Responsible for memory, speech, the senses, and emotional response.



Medulla (diencephalon)

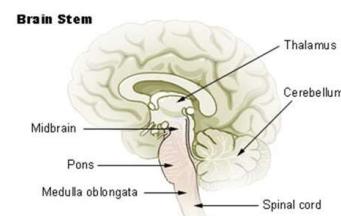
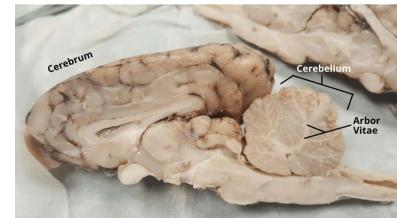
- Is inside the cerebrum above the brain stem.
- Functions include sensory function, food intake control, and the body's sleep cycle.
- Divided into sections:
 - Thalamus
 - Hypothalamus
 - Epithalamus



- Thalamus – 2 lobes, relay station for sensory impulses from spinal cord to cerebrum
- Hypothalamus = maintains Homeostasis.
- Connected to the pituitary gland
 - SUPRAOPTIC NUCLEUS – secretes antidiuretic hormone
 - PARAVENTRICULAR NUCLEUS – secretes oxytocin – contracts smooth muscle
 - PREOPTIC NUCLEUS – regulates autonomic activity such as body temperature
 - TUBERAL REGION – (multiple nuclei) = synthesis of hormones
- Epithalamus
 - Controls sleep e.g. Circadian rhythm
 - Pineal gland secrets melatonin

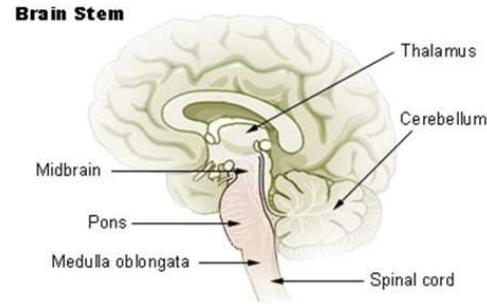
CEREBELLUM

- Co-ordinates and controls movement from the cerebrum – voluntary & involuntary
- 3 lobes.
- Contains specialized nerve cells = PURKINJE CELLS (found in the cortex).
- Area called arbor vitae (tree of life) – looks like a tree.



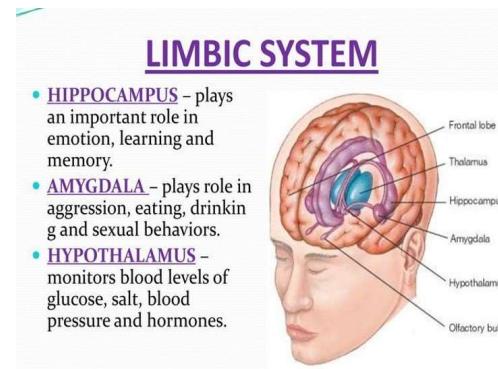
Brain stem

- Continuous with spinal cord
- Carries sensory impulses from the spinal cord to the thalamus
- Carries motor impulses from the cerebral cortex to the spinal cord



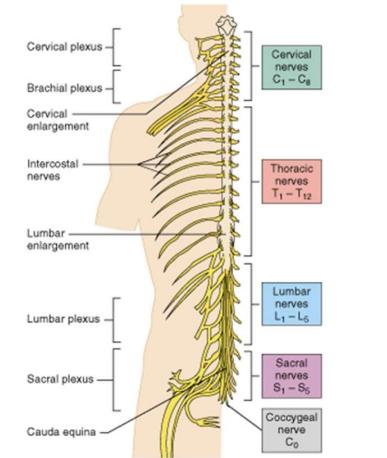
Limbic system

- Lies between the hypothalamus and the cerebrum
- **Considered to be the epicenter of emotional and behavioral expression.**
- Five “F’s”:
 - Feeding (satiety & hunger)
 - Forgetting (memory)
 - Fighting (emotional response)
 - Family (sexual reproduction and maternal instincts)
 - Fornicating (sexual arousal)



Spinal cord

- Connecting link from brain & nerves to the body.
- Involved in reflex actions.
- Located within spinal column = 31 vertebrae
- Protected by meninges
 - Pia mater
 - Arachnoid
 - Dura mater



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The Spinal cord: reflexes

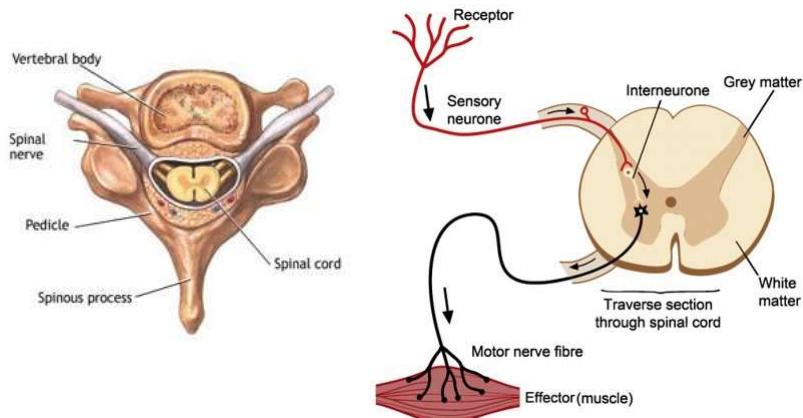
Reflex =

Neural pathway, that controls action reflex with a synapse in the spinal cord.

Monosynaptic = neural response of 2 neurones (one sensory, one motor)

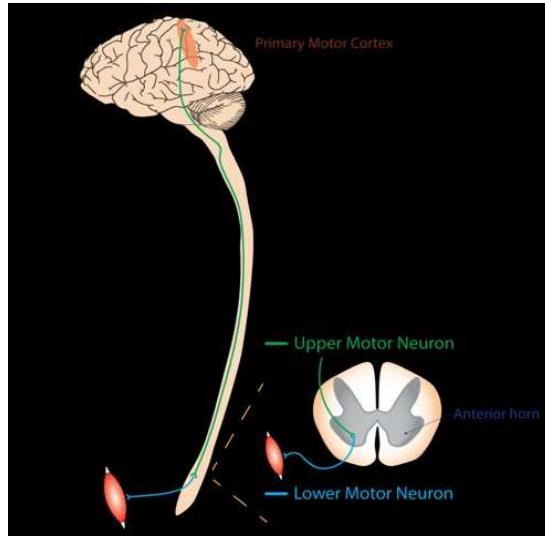
Polysynaptic = one or more interneurons connect afferent (sensory) and efferent (motor) signals.

By not routing signals through the brain – response is much quicker. Brain will still receive sensory response.



Monosynaptic/Polysynaptic response

Upper & Lower Motor Neurone

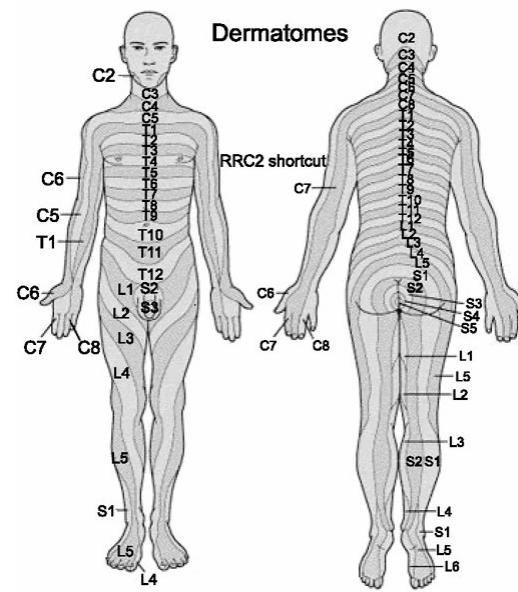
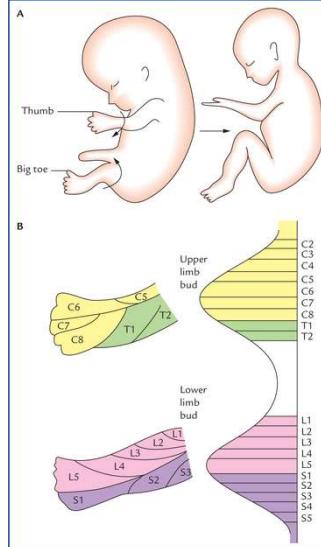


- Motor neurones are cells in the brain and spinal cord that allow us to move, speak, swallow and breathe by sending commands from the brain to the muscles that carry out these functions.
- Their nerve fibers are the longest in the body, a single axon can stretch from the base of the spinal cord all the way to the toes.
- Divided into either upper or lower motor neurones¹, forming various tightly controlled, complex circuits throughout the body. This controls both voluntary and involuntary movements
- The upper motor neurones originate in the cerebral cortex and travel down to the brain stem or spinal cord
- The lower motor neurons begin in the spinal cord and go on to innervate muscles and glands throughout the body

https://www.physio-pedia.com/Motor_Neurone

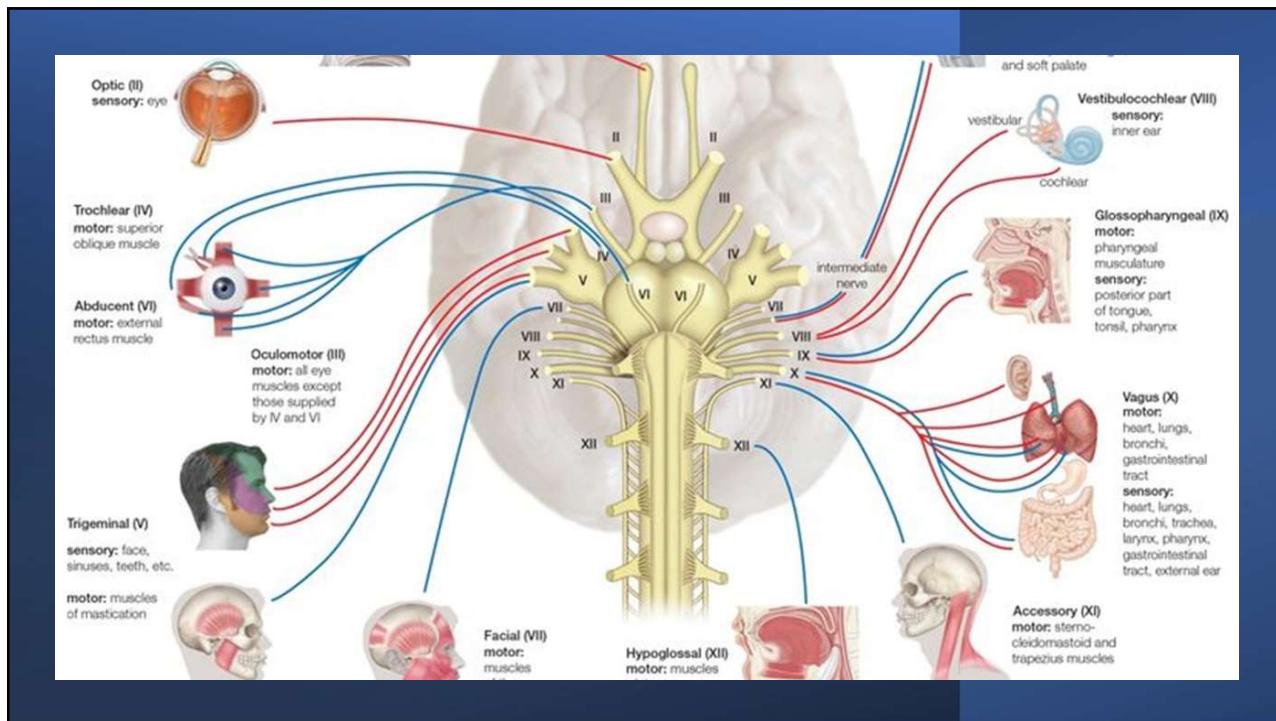
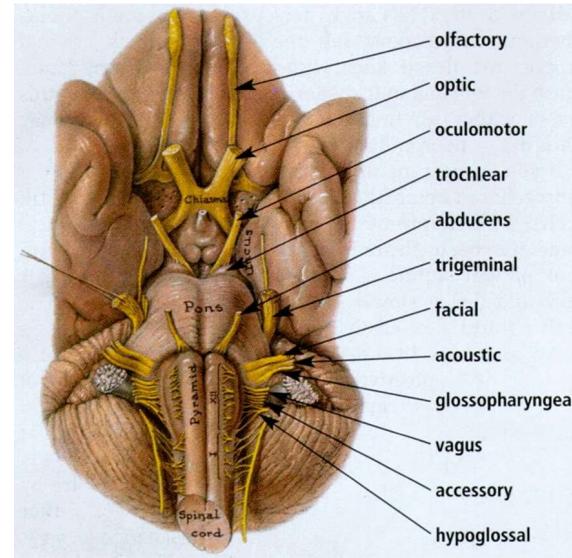
Dermatomes

- Area of skin supplied by a single spinal nerve.
 - Cervical – 8
 - Thoracic – 12
 - Lumbar – 5
 - Sacral/
 - Coccygeal - 6



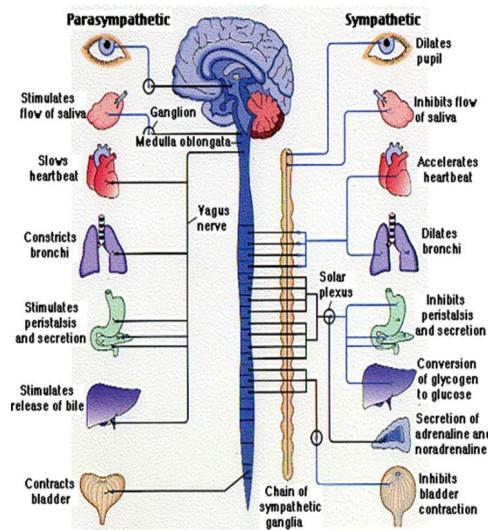
Cranial nerve

- I – Olfactory
 - II – Optic
 - III – Oculomotor
 - IV – Trochlear
 - V – Trigeminal
 - VI – Abducens
 - VII – Facial
 - VIII – Acoustic
 - IX – Glossopharyngeal
 - X – Vagus
 - XI – Accessory
 - XII - Hypoglossal
- On
Old
Olympus
Tower ing
Tops
Are
French
And
German
Vines
And
Hops



Autonomic nervous system

- Contains motor neurons that regulate the visceral organs and affect glands, smooth and cardiac muscles.
- Sympathetic division- fight or flight
- Parasympathetic division- baseline body functions



When would you do a neurological examination ?

- Head Injury
- Vertigo
- Dizziness
- Parasthesia
- Headache
- Seizures
- Loss of Consciousness
- Visual impairment
- Any other?

- What are the basic components of a bedside neuro check/assessment

What are the basic components of a bedside neuro check?

1. Assess level of consciousness (client's response to auditory and/or tactile stimulus)
2. Vital signs (RR, HR, BP, O₂ sat, temp - all are important!)
3. Blood sugars ?
4. Check pupillary response to light
5. **Assess motor function:** strength of hand grip and movements of extremities
6. **Assess sensory function:** ability to sense touch/pain in extremities

When should the bedside neuro check be postponed, and treatment started immediately?

- Start with basic “ABCs”: if the pt has problem with any/all of these, stop and initiate treatment.
- If the pt was previously alert and oriented, and now the pt is unresponsive (asleep?), get help right away.

History

- Timing : sudden , slow progression of symptoms
- Headache, migraines , head injury
- Loss of consciousness, any witnesses?, seizures
- Sleep disorders, vertigo, tinnitus
- Parasthesia, tremors
- Erectile Dysfunction
- Dysphagia, bladder & Bowel Dysfunction
- Vascular
- Memory, arousal, agitated, change in behaviour, confused
- Visual impairment/loss
- Pain, fever, infection,
- Children: immunisation status
- Drugs; prescribed, OTC and recreational

Other information

- Past Medical History:
 - Stroke, Diabetes, Hypertension, Accidents
- Family History:
 - Parkinson, Alzheimer's, Brain tumour
- Social History:
 - stress, lifestyle, occupation, drugs
- Health Beliefs

Mental assessment

- Conscious level
- Glasgow Coma Scale
- Published in 1974 by Graham Teasdale and Bryan Jennett - professors of neurosurgery at Glasgow University.
 - Eye response = 1-4
 - Verbal response = 1-5
 - Motor response = 1-6
- Written as : best response = E4, V5, M6 = 15/15
- AVPU

Interpreting the Glasgow Coma Score

Assess the severity of a traumatic brain injury (TBI) by adding the patient's score in each of the three categories below to determine the Glasgow Coma Score. Interpret the score as follows:

- 13-15, mild TBI
- 9-12, moderate TBI
- 3-8, severe TBI

Eye opening

- 4 = Opens eyes spontaneously
- 3 = Opens eyes to speech
- 2 = Opens eyes only in response to painful stimuli
- 1 = No eye opening in response to painful stimuli

Best motor response

- 6 = Obeys simple commands
- 5 = Localizes to painful stimuli and attempts to remove source
- 4 = Withdrawal in response to painful stimuli
- 3 = Flexor posturing: Flexes elbows/wrists while plantar flexing feet in response to painful stimuli
- 2 = Extensor posturing: Extends upper and lower extremities in response to painful stimuli
- 1 = No motor response to painful stimuli in any limb

Best verbal response

- 5 = Oriented to person, place, and time
- 4 = Confused
- 3 = Inappropriate words
- 2 = Incomprehensible sounds
- 1 = None

Categories of Glasgow Coma Scale

What's the highest score possible?
What's the lowest score possible?

Glasgow Coma Scale

BEHAVIOR	RESPONSE	SCORE
Eye opening response	Spontaneously	4
	To speech	3
	To pain	2
	No response	1
Best verbal response	Oriented to time, place, and person	5
	Confused	4
	Inappropriate words	3
	Incomprehensible sounds	2
	No response	1
Best motor response	Obeys commands	6
	Moves to localized pain	5
	Flexion withdrawal from pain	4
	Abnormal flexion (decorticate)	3
	Abnormal extension (decerebrate)	2
	No response	1
Total score:	Best response	15
	Comatose client	8 or less
	Totally unresponsive	3

Categories of Glasgow Coma Scale

- What's the highest score possible?
15 (alert & oriented)
- What's the lowest score possible?
3 (deeply comatose)

Glasgow Coma Scale

BEHAVIOR	RESPONSE	SCORE
Eye opening response	Spontaneously	4
	To speech	3
	To pain	2
	No response	1
Best verbal response	Oriented to time, place, and person	5
	Confused	4
	Inappropriate words	3
	Incomprehensible sounds	2
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Best motor response	Obeys commands	6
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Total score:	Best response	15
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What are the definitions for the 4 Levels of Consciousness?

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- **Alert:** maintains wakefulness, responds immediately to command
- **Lethargic:** sleepy response to command may be slow or incomplete. Needs stimuli but does obey. Returns to sleep when not stimulated.
- **Stuporous:** does not obey commands, needs vigorous stimulations. spontaneous or purposeful movement may be noted.
- **Comatose:** unable to arouse

How do we properly "escalate stimulation" to get a reliable response in a poorly responsive or comatose patient?



We gradually give more adequate stimulation in form of a pressure or irritation to the point of pain if the pt still does not respond.



sequence: voice, shout, shake, pain



to start, even if possibly comatose, speak gently as you say "it's time to wake up"



if pt doesn't respond, you shout at him



if pt doesn't respond, you shake him - more than just a slight motion!



if pt doesn't respond, apply pain.

What are early changes in level of consciousness that could indicate signs of a clinical problem (increased ICP)?

- Most sensitive: a change in the level of consciousness! The pt needs more stimulation to display the same responses
- loses details in test of orientation
- forgetful
- restless
- suddenly quiet after severe restlessness

The Basic Orientation Questions



ALWAYS ASK OPEN ENDED QUESTIONS;



NEVER TELL THE PT THEIR NAME AT BEGINNING,
E.G. "GOOD MORNING, MR. OERTEL, WE ARE
GOING TO DO A SHORT NEURO EXAM NOW."



PT'S LOSE THEIR ORIENTATION (TYPICALLY) IN
THIS ORDER: TIME, THEN PLACE, AND LAST
PERSON.

The Four Basic Orientation Questions

- **Person:** Tell me your full name
- **Place:** Where are you right now? What kind of place is this (hospital, home, store, school) - may not know name of hospital but knows type of building
- **Time:** Tell the year, month, day, day of the week, most recent holiday (if just happened)

The Basic Orientation Questions



Always ask open ended questions;



Never tell the pt. their name at beginning,
e.g. "good morning, Mr. Oertel, we are
going to do a short neuro exam now."



Pt's lose their orientation (typically) in this
order: time, then place, and last person.

The Four Basic Orientation Questions

- **Person:** Tell me your full name
- **Place:** Where are you right now? what kind of place
is this (hospital, home, store, school) - may not know
name of hospital but knows type of building
- **Time:** Tell the year, month, day, day of the week,
most recent holiday (if just happened)
- **Why are you in the hospital?** (not: what brought you
to the hospital? "Cab, car, ambulance")

How would you test for orientation in the patient with communication problems?

- Have pt speak slowly and listen carefully;
- Have pt write answers on pad;
- Give multiple choices and pt chooses ("are You in a school, at home, at hospital?");
- Have answer yes/no to questions (is this a school, your home, a hospital?)

How do you test for "obeys commands" for Motor Response?

- After establishing orientation, ask the pt. to hold up two fingers.
- Highest ability is to follow commands.

What do you say to the family of a comatose patient who grasps your fingers when placed in his palm but is unable to follow the command to release your fingers?

What do you say to the family of a comatose patient who grasps your fingers when placed in his palm but is unable to follow the command to release your fingers?

- Many pts (e.g., comatose) who cannot follow commands still have a primitive grasp reflex like an infant.
- **Show family:** will grasp fingers automatically but cannot follow the command, "open your hand, let go of my fingers"

Describe what a localized or purposeful response to pain would look like.

Describe what a localized or purposeful response to pain would look like

- pt. will try to remove the irritant or try to avoid pain: e.g., try to grab source of pain (your hand), pull N/G tube, or suction tube.
- This is not as high a level: He cannot follow commands, even with painful stimulation.

How does withdrawal to pain differ from localized or purposeful response to pain?

How does withdrawal to pain differ from localized or purposeful response to pain?

- **Localized or purposeful response to pain:** it is purposeful, that is pt actively goes toward the source of pain/irritation versus
- **Withdrawal to pain:** some part of the body moves pain inflicted but doesn't try to remove, specific part where pain is may not move; **movement may not be purposeful**

What is central pain and peripheral pain?

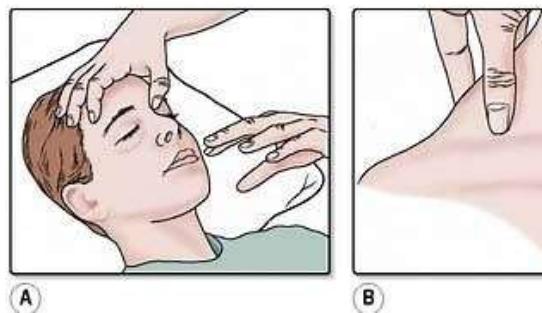
- **Central pain:** brain responds to central stimulation;
- **Peripheral pain:** the spine responds to peripheral stimulation – a reflex response
- **You must use the proper technique to elicit the proper response.**



Central Pain techniques

A. Supraorbital pressure: feel along underneath the eyebrow just under the orbital rim in the middle, then gently search with your fingertips for a little notch. A nerve runs through the notch; pressing it hard makes it feel like you're producing an instant sinus headache on that side.

Contraindicated with cranial and/or facial fractures,



B: Trapezius squeeze: using thumb and two fingers as pincers, feel for the mass of the trapezius muscle (located in the angle where the neck and shoulder meet); take hold of about two inches of muscle, and twist about one-half inch. It hurts but not real pain.

Central Pain Techniques

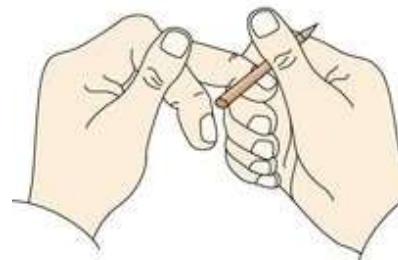
- **Sternal rub:** with your knuckles, act as if you're grinding a pill in the middle of the pt's sternum. Will cause bruising! - not our goal

AVOID



Peripheral Pain - Technique

- Place pen or pencil across the pt's nailbed at the base of the cuticle, then apply firm pressure with your thumb over the pencil, enough to cause a crushing pain. Alternate sites to prevent bruising.
- Many nurses think that this is an assessment for central pain – now you know the difference!



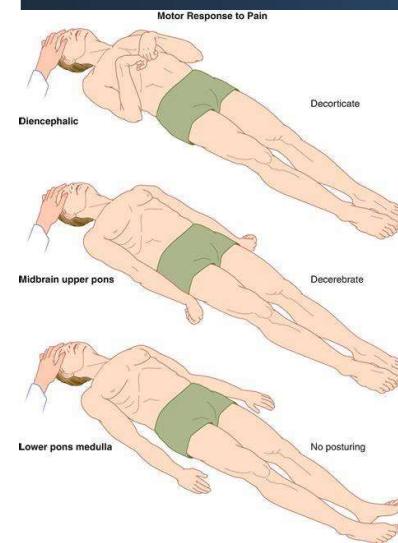
Describe the two types of posturing and the level of brain where each occurs.

Describe the two types of posturing and the level of brain where each occurs

Decorticate/flexion: Flexion of arms to chest (arms move toward the core) with legs rigidly extended; part of brain still functioning

Decerebrate/extension: Arms and legs are rigidly extended; functioning on brain stem only

Note: Not uncommon to have both at same time (decorticate one side, decerebrate the other) and alternating



How do you perform the motor test for the upper and lower extremities?

- **Upper extremity strength:** With both arms extended (stretched out in front of pt.), apply pressure downward on both arms at same time while pt. actively resists.
- **Hand grip strength:** Using only your index and middle fingers, have pt. squeeze them with both hands at same time (test for equality).

How do you perform the motor test for the upper and lower extremities?

- **Lower extremity strength:** Raising each leg, one at a time, apply pressure downward while pt. actively resists; repeat on other side
- **Ankle dorsiflexion:** At the same time, have pt. press both feet downward against your hands "like pressing on the gas pedal";
- **Note:** Usually down with ankle plantar flexion - have pt. press both feet upward against your hands "towards your nose"; dorsiflexion and plantar flexion = "pushes and pulls"

How is motor testing modified for patients with neck, back or extremity problems/surgery?



How is motor testing modified for patients with neck, back or extremity problems/surgery?

Because of the risk of damage to an injured area or surgical site, NEVER have pt actively resist against gravity when pt has neck, back or extremity problems/surgery!!

How is motor testing modified for patients with neck, back or extremity problems/surgery?

Modification:

- **Upper extremity strength:** test the biceps strength in each arm by having pt. flex arm against your slight resistance
- **Lower extremity strength:** have pt. bend one knee at a time, you apply slight resistance downward against knee as pt. tries to keep knee bent

What is the proper technique for assessment of pupillary response to light?

What is the proper technique for assessment of pupillary response to light?

- Dim the lights; the room should be completely dark!
- Hold a penlight about 8 inches from the pt's face in the peripheral field of vision.
- Look at the pupil: how big is it before the exam?
- Come in from the side and shine the light directly into the eye. Both pupils should constrict immediately, but the one receiving direct light should constrict more than the other. Don't hold the light in eye for more than 5 seconds!
- Repeat the test in the other eye.
- Record the size and reaction (slow, brisk) of the pupil after the light is in the eye (maximum constriction)

What is the proper technique for assessment of pupillary response to light?

Suggestions for very dark pupils:

- Have lighter in the room though still dim
- Look at the pupil from the side before the exam in order to determine the size of the pupil
- Sometimes you can't see the constriction, but you know that it happened because it dilates when you take the light away!

Anisocoria= naturally unequal pupils

- **Clinical significance:**
don't confuse with acute neuro problem!
- Don't be confused by misshaped pupils from eye surgery!



What is the clinical significance of acute onset of one dilated pupil in a neuro patient?

What is the
clinical
significance of
acute onset of
one dilated
pupil in a neuro
patient?

- Acute neuro problem, e.g., severe bleeding or swelling in brain;
- Usually accompanied by other neuro signs/symptoms

early signs
("signposts") of
increased
intracranial
pressure (ICP):
Pupillary
changes

- "blown pupil" - pupil becomes fixed (no reaction) and dilated, with neuro changes (time for immediate CT of head!)

early signs of increased intracranial pressure (ICP): Pupillary changes – Ovoid pupil

- Ovoid/transitional pupil: normal pupil takes oval shape when increased ICP is about to become very high
- May last minutes to hours
- Get medical assistance STAT: “the pt has an ovoid/transitional pupil” in the presence of neuro symptoms

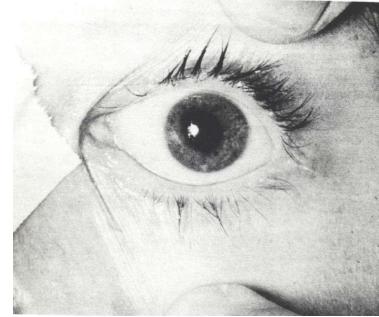
early signs of increased intracranial pressure (ICP): Vital signs

Vital signs

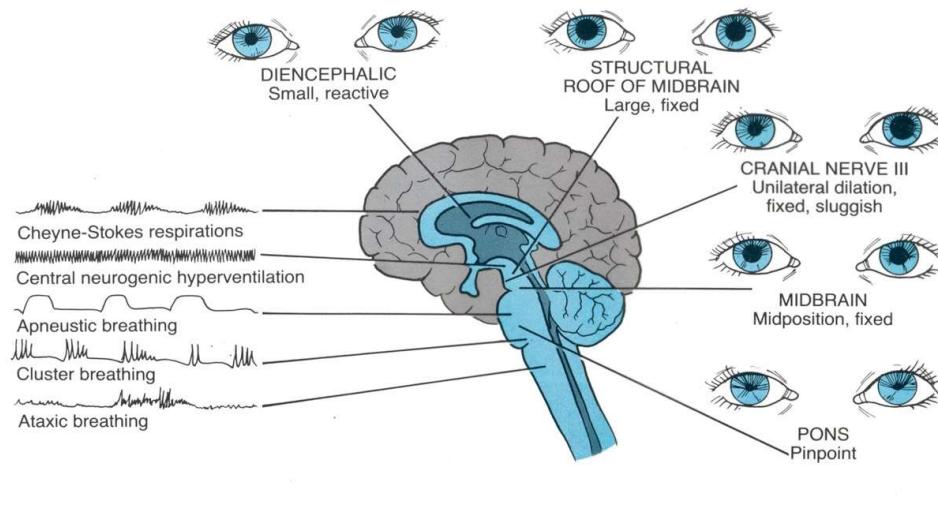
- Not a reliable early indicator
- intermittent hypertension
- Cushing's triad (late sign)
 - Reduced pulse rate and increased BP
 - Resp chaotic
 - Temperature high

Early signs ("signposts") of increased intracranial pressure (ICP): Pupillary changes – Ovoid pupil

- **Ovoid/transitional pupil:**
normal pupil takes oval shape when increased ICP is about to become very high
- May last minutes to hours
- Get medical assistance STAT:
“the pt has an ovoid/transitional pupil” in the presence of neuro symptoms



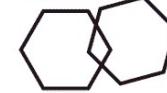
- Almost always indicates intracranial hypertension
- A transitional phase between normal round and fixed, dilated pupil from brain herniation
- (May also occur after eye surgery)



Mini Mental Status test

1. Orientation to time
2. Orientation to place
3. Registration
4. Calculation
5. Recall
6. Language
7. Repetition
8. Complex commands

Maximum score	Score	
5	—	Orientation
5	—	What is the (year) (season) (date) (day) (month)?
3	—	Where are we (state) (county) (town or city) (hospital) (floor)?
5	—	Registration
	3	Name three common objects (e.g., "apple," "table," "penny")
	—	Take one second to say each. Then ask the patient to repeat all three after you have said them. Give one point for each correct answer. Then repeat them until he or she learns all three. Count trials and record.
	—	Trials: _____
	—	Attention and calculation
	—	Spell "world" backwards. The score is the number of letters in correct order.
	—	(D_L_R_O_W_)
	—	Recall
	2	Ask for the three objects repeated above. Give one point for each correct answer.
	—	(Note: recall cannot be tested if all three objects were not remembered during registration.)
	1	Language
	3	Name a "pencil" and "watch."
	1	Repeat the following: "No ifs, ands or buts."
	1	Follow a three-stage command:
	1	"Take a paper in your right hand, fold it in half and put it on the floor."
	1	Close your eyes.
	1	Write a sentence.
	—	Copy the following design.
	—	Total score: _____



Other Neurological assessment

Base line observation's ✓

Assess GCS ✓

- Mental State

Neurological assessment

- Cranial nerves
- Motor
- Co-ordination

Cranial nerve assessment

- Smell – I
- Sight – II
- Pupil Reaction – III
- Eye opening, extra-ocular movements – III, IV, VI
- Facial sensation, jaw movements, corneal reflexes – V
- Facial movements, gustation – VII
- Hearing, balance – VIII
- Swallowing, elevation of palate, gag reflex, gustation – IX, X
- Voice, speech - V, VII, X, XII
- Shoulder shrug, head turning – XI
- Movement and protrusion of tongue - XII

"You can see a lot just by observing."

Yogi Berra

The Neurologic Exam often can be completed during the clinical history

- Assess: the patient's articulation, content of speech, and overall mental status
- Inspect: the patient's facial features, facial movement, and note any asymmetry. Note the patient's eye movements, blinking, and the relation of the palpebral fissures to the iris, look for en or exophthalmos.
- Observe: how the patient swallows saliva and breathes. Inspect the posture and look for tremors or involuntary movements

The Technique of the Neurologic Examination by William DeMyer Fifth Edition 2004 McGraw Hill Publisher

Cranial nerve assessment

- Ask about change in smell (I)
- Ask about change in taste (IX, VII)
- Test sensation to face – forehead, cheek/side of nose, chin (V)
- Screw up eyes – resist opening
- Visual Acuity, Fields, Accommodation, Convergence (II)
- Pupil reaction (II, III) – note size
- Eye movement (III, IV, VI)
- Test hearing (VIII)
- Ask to clench teeth – test masseters (V, VII)
- Smile (V, VII)
- Open mouth (IX, X)
- Say “Ahhh” (IX, X) – note movement of uvula
- Protrude tongue and move side to side (XII)
- Test strength of head movement with hand on face (XI)
- Shoulder shrug (XI)

Cranial nerve assessment

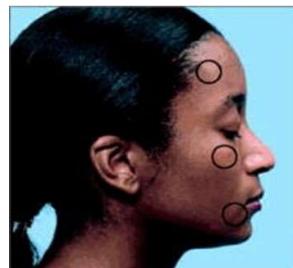
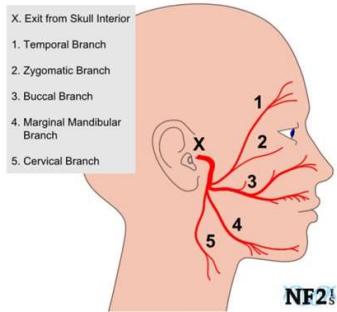
CN I



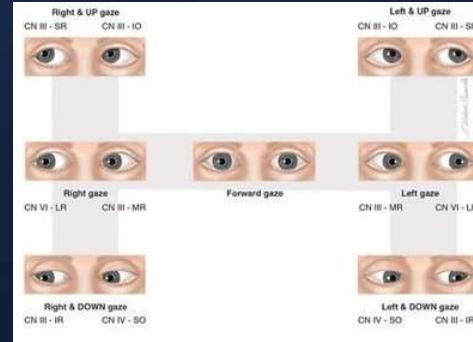
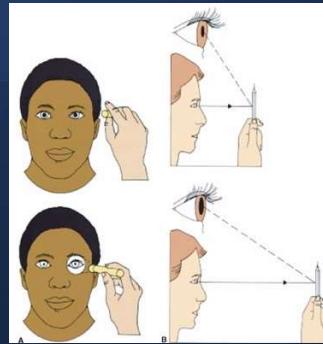
CN IX, VII



Cranial nerve assessment

CN7 - Facial Nerve
Paths of the 5 Exterior Branches

Cranial nerve assessment



CN III, IV, VI

CN VII

- **Conductive deafness**
 - Middle ear disease;
 - external ear meatus obstruction e.g., wax
- **Sensorineural deafness**
 - *Lesions of the cochlea*
 - *Otosclerosis, Meniere's disease; drug or noise induced damage*
 - *Lesions in the nerve*
 - *Meningitis; tumor; trauma*
 - *Lesions in the nucleus in the pons*
 - *Vascular or demyelinating lesions*

• Test to see can the patient hear fingers rubbed together or words whispered just outside of the auditory canal and identify which ear hears the sound?

• A tuning fork can be used to perform the Weber and Rinne test to evaluate sensori-neural and conductive hearing loss respectively

Cranial nerve assessment

- CN VIII

512 Hz tuning fork

Rinne's test:

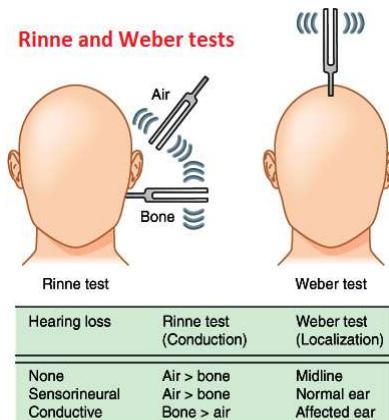
First, hold tuning fork on mastoid process (bone conduction BC)
Then in front of ear (air conduction- AC)

Normally, air conduction persists twice as long as bone conduction.

A normal Rinne's test is called a 'Positive Rinne's test'.

Rinne-negative test is abnormal and means that bone conduction is greater than air conduction.

Rinne and Weber tests



WEBER

Tuning fork is held on the vertex of ear

Ask patient which ear if loudest- good ear or deaf ear

With complete sensorineural deafness in one ear, BC from the other ear will be better than air conduction

Cranial nerve assessment



Smile/show teeth/puff cheeks out

CN V, VII



Say 'ahh' - note uvula
Gag reflex

CN IX, X



Stick tongue out
Note deviation, atrophy or fasciculations

CN XII

Cranial Nerve Assessment



Shrug shoulder &
Turn head against your hand
in both directions

Note weakness



Motor assessment

- Inspection
 - Atrophy?
 - Bulk?
 - Symmetry?
 - Twitching? (*Fasciculation*)
- Tone
 - Resistance?
 - Floppy?
 - Rigid?



Muscle strength

Upper limb

- Elbow – flexion & extension
 - (C6,C7,C8)
- Wrist - flexion & extension
 - (C6,C7,C8)
- Grip/finger abduction
 - (C7, C8, T1)

Lower limb

- Hip – Flexion
 - (C6, C7, C8)
- Hip – Abduction
 - (L4, L5, S1)
- Hip – Adduction
 - (L2, L3, L4)
- Knee – flexion
 - (L4, L5, S1)
- Knee – extension
 - (L2, L3, L4)

Muscle strength grading

- 0 = no evidence of movement
- 1 = trace of movement
- 2 = Full range of motion but not against gravity (passive only)
- 3 = Full range of motion against gravity but not against resistance
- 4 = Full range of motion against gravity and some resistance but weak
- 5 = Full range of motion against gravity, full resistance



Reflexes – upper limb



Triceps (C7,8)



Biceps (C5,6)

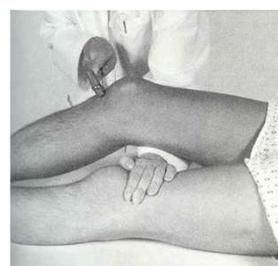


Branchioradialis (C5,6)

Reflexes- lower limb



Patellar Reflex (L2 – L4)



Achilles Reflex



Reflex grading

- 0 = no response
- 1+ Somewhat diminished: low normal
- 2+ Average: Normal
- 3+ Brisker than average, but not necessarily indicating disease
- 4+ very brisk, hyperactive

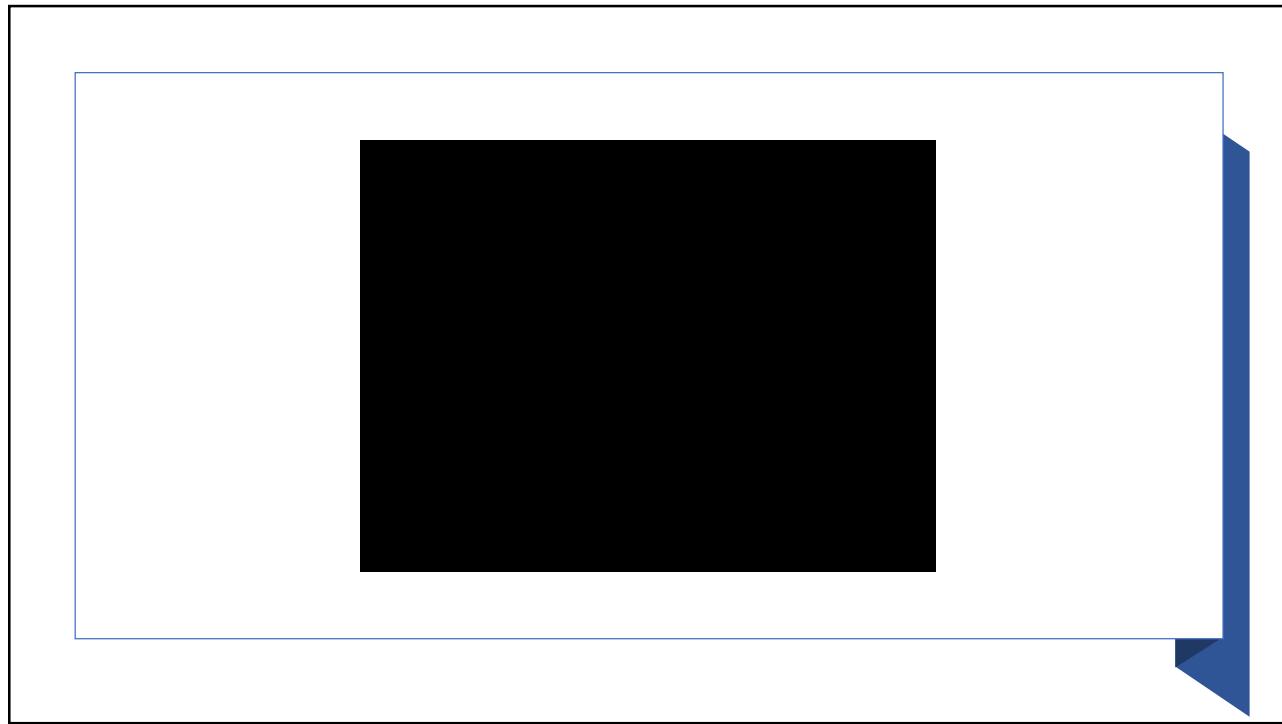


Babinski's reflex



In healthy babies under 12 months (? < 24 months) old, will have a *positive Babinski* normally
- Eg an **opposite** response till age 12-24 months

- Gently draw an orange stick up the lateral border of the foot and across the foot pad
- If all toes flex: *Normal response* (negative Babinski reflex)
- If Big toe extend and other toes spread= *Positive Babinski*
 - Upper Motor Neurone lesion *
- If big toe and all other toes extend and ankle flexes: *withdrawal response*- repeat more gently



Co-Ordination

Gait

Tests proprioception, cerebellar function

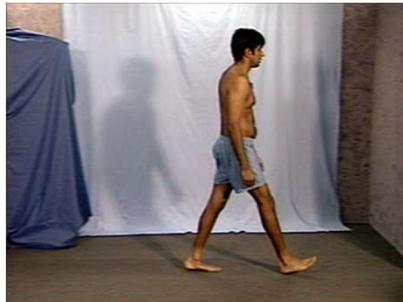
Balance

Co-ordination

Skilled movements



Gait



Normal gait is a co-ordinated action requiring integration of sensory and motor function

Gait – posture, balance, shuffling

Gait

Heel to toe, toe walking, heel walking

- Heel to toe walking – unable to walk with a midline cerebellar lesion
- **Cerebellar degeneration-progressive loss of Purkinje cells** in the cerebellum.
- Wide range of causes including:
 - **chronic alcohol abuse, nutritional deficiency** (typically B12), **paraneoplastic disorders** and **neurological diseases** (e.g. multiple sclerosis, spinocerebellar atrophy).



Walking on toes (L4/5) & heels (S1)



Gait : some abnormalities

Foot drop

- Unilateral: *peroneal nerve palsy L5 lesion*
- Bilateral: *Peripheral neuropathy*

Shuffling

- Eg *Huntington's disease*

Hemiplegic:

- unilateral upper motor neurone lesion – *Stroke, MS*

Ataxia- uncoordinated- wide stance

- *Alcohol- some drugs – MS- Cerebrovascular disease- I*

• Stooped with reduced arms swing- *Parkinsonian*

- may also have difficulties to start & stop= *festinant*

• Upright with marked arm swing- *Marche a petit pas*

- (cortical dysfunction, Cerebrovascular disease)

• Scissoring- eg. *Cerebral palsy, MS, cord compression*

Co-ordination: ROMBERG test

(Sobriety test)

Romberg Test



- The subject stands with feet together, eyes open and hands by the sides.

- The subject closes the eyes while the examiner observes for a full minute.

- Tell the patient you will catch him if he falls

- Romberg's test is positive if the patient sways or falls while the patient's eyes are closed.

- Indicates loss of joint position sense

Causes included:

- Cord compression- Vit b12 deficiency (rare)
- Degenerative spinal cord disease- \\\\\\
- Peripheral neuropathy : *Guillain-Barre syndrome-Diabetes-; Charcot-Marie-Tooth disease*

Co-ordination: Pronator Drift

- Ask the patient to hold both arms fully extended at shoulder level in front of him, with the palms upwards, and hold the position.
- If they are unable to maintain the position the result is positive.
- Closing the eyes accentuates the effect, because the brain is deprived of visual information about the position of the body and must rely on proprioception.
- Tapping on the palm of the outstretched hands can accentuate the effect.



- Positive with eyes open:** Motor deficit
- Positive with eyes closed:** Sensory deficit (Posterior column)
- Outward and upward drift:** Cerebellar drift
- "Updrift"** (involved arm rising overhead without patient awareness): Parietal lobe lesions (loss of position sense)
- Drift without pronation:** Functional upper limb paresis (Conversion disorder)

Co-ordination

- Compare both sides
- Observe for tremor- any disorganisation of the movements or irregularities = **dysmetria**
 - Dysmetria is the inability to control the distance, speed, and range of motion necessary to perform smoothly coordinated movements. Dysmetria is a sign of cerebellar dysfunction

- Hold finger an arms length in front of the patient
- Ask the patient to touch your index finger with his/her index finger and then touch his nose
- Then repeat faster
- Can be made more sensitive by moving target finger

Finger to nose test :Assesses cerebellar function



Co-ordination

Assesses cerebellar function

- Compare the 2 sides
- Observe for
 - disorganisation of movements
 - wider excursion than expected
 - Irregularity of movement performed without rhythm

Rapid Alternative Movements



- GALS assessment

Sensory Examination

- Vibration test – DIPJ Big toe

- If sensation felt equal both toes – no need to assess higher up limb



- Proprioception Test

- Move big toe at DIPJ – ask patient to close eyes.
- Can they say if toe is up or down?



Discriminative Sensations

- Discrimination with soft and “sharp”



- Stereognosis
 - Identify object by touch
- Graphesthesia
 - Number identification



- Lower limb neuro exam video



3-minute neuro exam from

The 3-minute neurological examination has been designed by neurologists to exclude sinister causes of headache including brain tumour and haemorrhage.

The brief neurological examination is suitable for patients whose history suggests migraine or tension-type headaches.

[https://gpnotebook.com/simplepage.cfm
?ID=x20040509161757089560](https://gpnotebook.com/simplepage.cfm?ID=x20040509161757089560)

Link to video

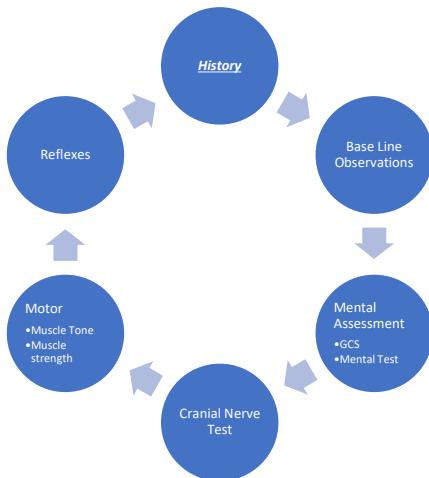
Examination	Notes
Romberg's test	Patient falling with eyes closed.
Tandem gait test	Heel-to-toe walking
Walking on heels	Tests pyramidal tract.
Drift of outstretched arms	Tests pyramidal tract.
Finger-nose test	Tests coordination.
Fine finger movements	Tests pyramidal and extrapyramidal tracts.
Hand tapping.	Cerebellar and brainstem disease.
Visual fields to confrontation	
Eye movements	
Face and tongue movements	
Fundoscopy	
Reflexes	

1 Minute exam

- Fundoscopy
- Eye movements
- Screw eyes tight closed, show teeth, stick out tongue
- Arms outstretched, touch nose-eyes closed, grip
- Rise from chair (arms folded), stand on heels /toes, rise from squat
- Stand with eyes closed
- Heel/toe walk

- Ref:
http://www.generalpracticemedicine.org/1322Redflags_JM_MP_March2017.pdf

Neurological Assessment – summary



- Co-Ordination/Balance
 - Gait
 - Balance
 - Romberg
 - Pronator Drift
- Co-ordination
 - Finger to nose test
 - Rapid alternate movements
- Sensory examination

Neurological Red Flags

- Neurological conditions
 - 1:10 GP consults
 - 10% emergency medical admissions (excl stroke)
 - Result in disability 1:50 UK population
 - Common (migraine prevalence 1:5 F, 1:15 M)
 - Rare (1200 Guillain-Barre pa incidence UK wide)

- Ref:
http://www.generalpracticemedicine.org/1322Redflags_JM_MP_March2017.pdf

Onset mode is key

- INSTANT
vascular, trauma, seizure
(double vision!)
- MINUTES-HOURS
infection, migraine
- HOURS-DAYS
immune, inflammatory
- DAYS-WEEKS
neoplasia
- MONTHS (YEARS)
degenerative

- REF Molloy, Punter .
http://www.generalpracticemedicine.org/1322Redflags_JM_MP_March2017.pdf -



Headache

RED FLAGS

- Headache in someone >50 years
- Thunderclap headache (**headache reaching maximum intensity within 60 seconds of onset**)
- Headaches increasing in severity and frequency
- Headache with fever, neck stiffness, or reduced level of consciousness
- Focal neurological symptoms or signs
- Papilloedema
- Headache after trauma
- Loss of vision
- Immunocompromised, Malignancy



- Headache is the most common neurological condition in the world, with more than 90% of people experiencing headaches at some point in their lives.
- 90% of headache presentations to the ED are due to primary headaches, usually tension headaches or migraine.
- Most patients will be discharged, and many require no investigation beyond a focussed clinical history and examination.

Ref: RCEM:

<https://www.rcemlearning.co.uk/reference/primary-headache/#1643120460862-b6f1beb6-b5e8>

Red Flags Back pain

- List Back Pain RED FLAGS

RED FLAGS BACK PAIN



- History of major trauma or minor trauma in the elderly
- Extremes of age(<20 or >55)- high risk of non MSK cause of pain)
- Systematic symptoms (weight loss, fevers, chills)
- History of malignancy
- Night pain
- Intravenous drug user
- Immunocompromised (HIV, chemotherapy)
- Chronic steroid use
- Rheumatoid arthritis /ankylosing spondylitis
- Significant /progressive neurological signs
- Bladder or bowel dysfunction
- Saddle numbness
- Osteoporosis
- Referred pain eg AAA

REF: Morris, F; Wardrope, J & Ramlakhan, (2014) *Minor Injury and Minor Illness at a Glance*. West Sussex: WILEY Blackwell
.page 63

Common causes of hearing loss

- Ref : Fisherman & Cullen (2018) Investigating sudden hearing loss in adults.
- BMJ . <https://www-bmj-com.rcn.idm.oclc.org/content/bmj/363/bmj.k4347.full.pdf>

Conductive hearing loss	Sensorineural hearing loss
<p>Caused by any pathology in the external ear, tympanic membrane, middle ear air space, or ossicles, ie, structures that "conduct" sound waves to the cochlea:</p> <ul style="list-style-type: none"> ear wax and foreign bodies otitis externa otitis media (acute or chronic; serous or suppurative)‡ tympanic membrane perforation cholesteatoma temporal bone trauma (resulting in haemotympanum or ossicular disruption)* otosclerosis (stapes fixation) 	<p>Caused by abnormalities of the cochlea, auditory nerve, or other structures that translate neural impulses to the brain:</p> <ul style="list-style-type: none"> presbycusis (age related hearing loss) Ménière's disease acoustic neuroma (vestibular schwannoma) * temporal bone trauma * late onset hereditary hearing loss noise induced hearing loss infections, eg, following meningitis, HIV, syphilis vascular causes (eg, apoplexy) autoimmune inner ear disease idiopathic sensorineural hearing loss

Red flags for hearing loss

- sudden or rapidly progressive +/- vertigo (over a 72 hour period). This is an acute otological emergency***
- progressive, ie, worsening over time
- unilateral/asymmetric (with or without tinnitus)**** (urgent referral to rule out acoustic neuroma)
- bilateral and profound (>95 dB HL)
- associated with other symptoms, such as otorrhoea (which may indicate chronic ear disease) or facial nerve palsy
- associated with head trauma***
- in an immunocompromised patient with accompanying otalgia with otorrhoea***

* Urgent referral to ENT/emergency department

Ref : Fisherman & Cullen (2018) Investigating sudden hearing loss in adults. BMJ . <https://www-bmj-com.rcn.idm.oclc.org/content/bmj/363/bmj.k4347.full.pdf>

NICE: Suspected neurological conditions: recognition and referral
Guidelines NG 127 –July 2019

- [1.1 Blackouts in adults](#)
- [1.2 Dizziness and vertigo in adults](#)
- [1.3 Facial pain, atraumatic](#)
- [1.4 Gait unsteadiness](#)
- [1.5 Handwriting difficulties](#)
- [1.6 Headaches in adults](#)
- [1.7 Limb or facial weakness in adults](#)
- [1.8 Memory failure and cognitive deterioration](#)
- [1.9 Posture distortion in adults](#)
- [1.10 Sensory symptoms including tingling or numbness in adults](#)
- [1.11 Sleep disorders in adults](#)
- [1.12 Smell or taste problems](#)
- [1.13 Speech, swallowing and language problems in adults](#)
- [1.14 Tics and involuntary movements in adults](#)
- [1.15 Tremor in adults](#)
- [1.16 Information and support](#)

Ref;
<https://www.nice.org.uk/guidance/ng127/chapter/Recommendations-for-adults-aged-over-16>

Any questions??

