

# *Clinical Skills*

## *CNS*



### Neurological Examination

### Motor Examination



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For your questions, comments and ideas:

Email: [OSCE.Team437@gmail.com](mailto:OSCE.Team437@gmail.com)  
Twitter: [@OSCE\\_Team437](https://twitter.com/OSCE_Team437)

# Objectives and materials:

**OBJECTIVE:** To conduct a complete Motor Examination as a part of Neurological Examination.

**MATERIALS:** Well illuminated examination room, examination table. (the rest are going to be explained with pics)

Clean gloves



Reflex hammer



Tuning fork



## Preparation

- 1- Introduce yourself to the patient.
- 2- Confirm patient's ID.
- 3- Explain the procedure and reassure the patient.
- 4- Get patient's consent.
- 5- Wash hands. (No need to wear gloves)
- 6- Prepare the necessary materials.
- 7- Show the patient each object and allow him/her to touch them prior to beginning the exam to reduce any fear of being hurt during the examination.
- 8- Position the patient in a **lying or sitting** position and uncover arms and legs.

Good morning I'm ... (your name)... I'm a second year medical student<sup>1</sup>. Can you tell me your name and give me your ID please<sup>2</sup>? Okay ... (patient name)... today I'm here to perform a motor examination<sup>3</sup> "that may include ....." , is that okay with you<sup>4</sup>? Before I start I should wash my hands<sup>5</sup> and prepare the materials<sup>6</sup> if you want you can see the materials<sup>7</sup>. I just want you to "sit or lie down" and expose your arms and legs to begin the examination<sup>8</sup> ..

## Examination

### Inspection:

9- Look for posture of the body (e.g. deformities, asymmetry, abnormal posture).



10- Look for abnormal movements (e.g. tremor, fasciculation, dystonia, athetosis).  
( **tremors** : abnormal move in both sides , **fasciculation** : abnormal movement in only one side)

11- Look for muscle bulk of the body and compare both sides.

9- By inspection, All what you're supposed to do is to notice any deformities, asymmetry, or abnormal posture according to the patient's posture of his/her body tell the doctor what you notice, but actually she/he's gonna be normal so you're gonna tell the doctor that she/he has no deformities, asymmetry, or abnormal posture.

10- ask her/him to move and while she/he's moving notice any abnormal movements for example: tremor, fasciculation, dystonia, or athetosis. Tell the doctor that she/he has no tremor, fasciculation, dystonia, or athetosis.

11-check for the muscle bulk and don't forget to compare both sides tell the doctor that she/he's normal.

## Muscle Tone:

12- Test the tone in the upper limbs by holding the patient's hand and simultaneously pronating and supinating and flexing and extending the forearm.

13- Test the tone in the legs by rolling the leg on the bed, by flexing and extending the knee, or by abruptly lifting the leg at the knee.

Okay so now I'll test your muscle tone

12-(upper limbs) all what you're supposed to do is to hold the patient's hand, pronate, supinate, flex and extend the forearm. ([Video](#))

13-(lower limbs) all what you're supposed to do is to roll his leg on bed by flexing and extending the knee or by lifting the leg at the knee. ([Video](#))

**"Do both tests in each sides to avoids doctor's comments"**

## Muscle Power : ( you should apply a resistance )

14- Test muscle strength for shoulder abduction elbow flexion and extension. Wrist flexion and extension, finger flexion, extension, abduction and adduction, and thumb abduction and opposition. Compare muscle strength on both sides, and grade it on the muscle strength scale\*.

15- Test muscle strength for hip flexion, extension, abduction and adduction, knee flexion and extension, plantar flexion and dorsiflexion of the foot and big toe, and inversion and eversion of the forefoot. Compare muscles strength on both sides, and grade it on the muscle strength scale\*.

I'll test your muscle power

14- shoulder abduction, elbow and wrist flexion and extension, finger flexion, extension, abduction and adduction and thumb abduction and opposition "don't forget to compare on both sides and grade it on the muscle strength scale" ([Video](#))

15- hip flexion, extension, abduction and adduction, knee flexion and extension, plantar flexion and dorsiflexion of the foot and big toe and inversion and eversion of the forefoot "don't forget to compare on both sides and grade it on the muscle strength scale" ([Video](#))

\* muscle strength scale in page 7

## Reflexes:

16- Test biceps<sup>1</sup>, supinator<sup>2</sup>, and triceps<sup>1</sup> reflexes with a reflex hammer.  
(Compare both sides. If a reflex cannot be elicited retest with reinforcement).(triceps 2 cm above elbow , biceps and supinator may not be clear so feel the muscle tendon contraction is enough)

17- Test the knee jerk and ankle jerk with a reflex hammer.  
(Compare both sides. If a reflex cannot be elicited retest with reinforcement).(knee jerk is below the patella there is a depression, ankle jerk it might be unclear)

## Reflexes:

18- Test for clonus by holding up the ankle and rapidly dorsiflexing the foot.

19- Test for the Babinsky sign (extensor plantar reflex) using the sharp end of a reflex hammer. (تمرر الاداة على باطن القدم بشكل حرف سي)

16- so I'm gonna reflex your biceps, supinator and triceps with a reflex hammer, don't forget to compare both sides and if the reflex cannot be elicited, retest stronger and don't forget to tell the doctor what you notice! Just tell him normal bc she/he's gonna be normal ([Video<sup>1-2</sup>](#))

17- I'll test your knee and ankle jerks by a reflex hammer, don't forget to compare both sides and if the reflex cannot be elicited, retest stronger and don't forget to tell the doctor what you notice! Just tell him normal bc she/he's gonna be normal ([Video](#))

18- I'll hold the ankle and rapidly dorsiflex your foot, it's better do both sides even if it's not written and inform the doctor that there is no clonus, bc again she/ he's not a real patient ([Video](#))

19- I'll test the extensor plantar reflex by using the start end of a reflex hammer for the Babinski sign, it's better do both sides even if it's not written and inform the doctor that there is no clonus, bc again she/ he's not a real patient ([Video](#))

## Co-ordination:

### 20- Resting tremor:

- Ask the patient to rest his hands in his lap and to close his eyes.

### 21- Test for Intention tremor:

- Ask the patient to do something (e.g. remove his watch or write a sentence).

### 22- Fine finger movements:

- Ask the patient to oppose his thumb with each of his other fingers in turn. Once he is able to do this, ask him to do it as fast as he can, remember that he has two hands.

### 23- Finger to-nose test carry out to test dysynergia and dysmetria:

- Place your index finger at about two feet from the patient's face. Ask him to touch the tip of his nose and then the tip of your finger with the tip of his index finger.
- Do the test bilaterally.

### 24- Test for dysdiadochokinesia:

- Ask the patient to clap and then show him how to clap by alternating the palmar and dorsal surfaces of one hand. Once he is able to do this, ask him to do it as fast as he can. Ask him to repeat the test with his other hand.

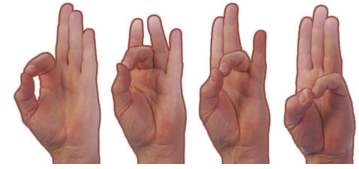
### 25- Heel to-shin test:

- Lie the patient down. Ask him to run the heel of one leg down the shin of the other, and then to bring the heel back up to the knee and to start again.
- Ask him to repeat the test with his other leg.

20- can you please rest your hands in your lap and close your eyes. Okay I'm now checking for any [resting tremor](#). (Usually the patient will be normal NO resting tremor)

21- can you please write your name. Okay I'm now checking for any [Intention tremor](#) (Usually the patient will be normal NO Intention tremor)

22- can you oppose your thumb with each of your other fingers in turn **Or** can you do like this "see the pic" . Then can you do it faster (remember to do this step for both hands) "[see this video](#)"



23- okay now can you please touch the tip of your nose and then the tip of my finger (Place your index finger at about two feet from the patient's face) with the tip of your index finger. (remember to do this step for both hands) "[see this video](#)"

24- now can you do like this "[see this video](#)". Okay do it faster please (remember to do this step for both hands)

25- can you Lie down please and bring your heel back up to your knee then run it down in front of the shin "[see this video](#)" (remember to do this step for both legs )

**Gait examination** (Always be in a position to steady the patient should he threaten to fall).

**26- Inspection:**

• Ask the patient to stand up. Ensure that he is steady on his feet and inspect his posture from both front and side.

**27- Gait and arm swing:**

• Ask the patient to walk to the end of the room and to turn around and walk back.

**Heel-to-toe test:** Ask the patient to walk (as if on a **tightrope**): heel-to-toe, then on their toes only, and finally on their heels only.

**28- Romberg's test:** Ask him to stand unaided with his arms by his sides and with his eyes closed.

(If the patient sways or loses balance then this test is positive)

Before we begin, (always be in a position to steady the patient should he threaten to fall )

26- can you please stand up? Ensure that he is steady on his feet and inspect his posture from both front and side.

27- can you please walk to the end of the room and to turn around and walk back? Now with the heel to toe test, can you please walk as if you're on a tightrope? Then with your toes only?

And now with your heels only? If she/he's normal so inform the doctor that the test is negative ([Video](#))

28- now with Romberg's test I want you to stand unaided with your arms by your sides and with your eyes closed, inform the doctor that the test is negative if she/he's normal but if you see sway or lose balance so the test is positive. ([Video](#))

A **tightrope** is a tightly stretched piece of rope on which someone balances and performs tricks in a circus.

## After the examination

29- Ensure that the patient is comfortable.

30- Make explanations to the patient, answer his/her questions and discuss management plan.

31- Dispose of sharps and waste material according to infection control standards.

32- Wash hands.

33- Document the procedure.

After finishing the examination,

29- Okay are you comfortable?

30- Do you have any questions?

31- "Dispose the wastes" (or just mention it "I should dispose the wastes ")

32- I'll wash my hands

33- I'll document the procedure, thank you.

## Muscle Strength Scale\*

Major skeletal muscles can be functionally assessed for their strength. Muscles are evaluated individually with comparison to that of the same muscle on the opposite side of the body. Muscle strength can be monitored over time to follow progression or remission of disease.

Findings	Grade
Normal motor power.	5
Able to overcome gravity and significant resistance but strength not quite normal.	4++
Able to overcome gravity and moderate resistance.	4+
Able to overcome gravity and mild resistance.	4
Able to overcome gravity but not resistance.	3
Unable to overcome the force of gravity but able to move in the plane of the supported extremity.	2
Flicker movements only.	1
Total paralysis (NO movement).	0

\* Miller DW Hahn JF. Chapter 1: General methods of clinical examination. pags 31-32. IN: Youmans JR. Neurological Surgery 4 edition. W.B. Saunders Company. 1996.

# Muscle Actions and Innervations\*

Upper Extremity			
Action	Muscle(s)	Nerve(s)	Nerve Roots
Arm abduction	Deltoid	Axillary	<b>C5</b> , C6
Elbow flexion	Biceps	Musculocutaneous	C5, C6
Elbow extension	Triceps	Radial	C6, <b>C7</b> , C8
Extension at the wrist	Forearm extensors	Radial	C6, <b>C7</b> , C8
Flexion of the wrist	Forearm flexors	Median & ulnar nerves	C6, C7, C8, T1
Wrist abduction	Flexor carpi radialis	Median	C6, C7
Finger extension	Extensor digitorum	Posterior interosseous	<b>C7</b> , C8
Finger flexion	flexor digitorum superficialis and flexor digitorum profundus (FDP)	median, anterior interosseous (FDP I & II), & ulnar (FDP III & IV)	C7, <b>C8</b> , T1
Abduction of index finger	First dorsal interosseous	Ulnar	C8, <b>T1</b>
Abduction of little finger	Abductor digiti minimi	Ulnar	C8, T1
Thumb abduction	Abductor pollicis brevis	Median	C8, <b>T1</b>
Thumb adduction	Adductor pollicis	Ulnar	C8, <b>T1</b>
Thumb extension	Extensor pollicis longus	Posterior interosseous	<b>C7</b> , C8
Lower Extremity			
Action	Muscle	Nerve	Nerve Roots
Hip flexion	Iliopsoas	Femoral	L1, L2, L3
Hip extension	Gluteus maximus	Inferior gluteal	<b>L5</b> , <b>S1</b> , S2
Hip abduction	Gluteus medius, minimus & tensor fasciae latae	Superior gluteal	<b>L4</b> , <b>L5</b> , S1
Hip adduction	Adductors	Obturator	<b>L2</b> , <b>L3</b> , L4,
Knee extensors	Quadriceps femoris	Femoral	L2, <b>L3</b> , <b>L4</b>
Knee flexion	Hamstring	Sciatic	L5, <b>S1</b> , S2
Ankle dorsiflexion	Tibialis anterior	Deep peroneal	<b>L4</b> , L5
Ankle plantar flexion	Gastrocnemius & soleus	Tibial	S1, S2
Toe extension <sup>+</sup>	Lower leg extensors (extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus [to the big toe])	Deep peroneal	<b>L5</b> , S1
Toe flexion	Flexor digitorum longus, flexor hallucis longus	Tibial	L5, <b>S1</b> , <b>S2</b>
Foot eversion	Peroneus longus & brevis	Superficial peroneal	L5, S1
Foot inversion	Tibialis posterior	Tibial	L4, L5

<sup>+</sup> The muscles are called extensors, the action is also sometimes described as toe dorsiflexion. (Curling of toes is called plantarflexion).

In the accompanying videotape since the muscles are extensors, I describe the action as extension of the toe.

*\*The Neurological Exam, Faculty of Medicine, University of Toronto, Canada.*

Available from: [http://www.utoronto.ca/neuronotes/NeuroExam/MRC\\_scale.htm](http://www.utoronto.ca/neuronotes/NeuroExam/MRC_scale.htm).



# Videos, pictures and notes:

- After you finish from each test or step inform the doctor about what you notice but usually you're gonna say "normal or the test is negative" bc he's not a real patient
- Don't forget to compare both sides
- Smile, don't stress
- Cut your nails
- Don't forget your stickers
- [Video of motor examination](#)
- [Video of upper limb neurological examination - Geeky medics](#)
- [Video of lower limb neurological examination - Geeky medics](#)

[Here is a video for the whole presecure:](#)

<https://youtu.be/EpmkMecd4EE>

# Advice: You have to punch those finals in the face ...

## Leaders :

Renad Alfirm , Ahad Algrain , Zeyad Alkhenizan

## Members :

- Anoud Alotaiby
- Dimah Alaraifi
- Gharam Julaidan
- Leena Alrahmah
- Renad Alsuellmi
- Shahad Aljebreen
- Ali Alammari
- Abdulelah Aldossari
- Faisal Alsaif
- Fahad Alfaiz
- Abduljabbar Alyamani

*You can do it.*