

**Comment:** Although it cannot fully duplicate the subtleties of the in-person evaluation, a neurological examination via televideo can provide sufficient information on which to base many clinical decisions, including a tele-EDSS score.

The following examination was developed by UCSF MS clinicians and validated against an in-clinic Neurostatus EDSS examination in 41 adults with MS (Bove et al, *Multiple Sclerosis Journal*, 2019 Oct;25(11):1526-1534).

It was further refined by Drs. Riley Bove, Richard Cuneo, Sasha Gupta, Joseph Sabatino based on cumulative experience with 60+ additional teleEDSS visits in June 2020.

“Primary results: Overall, 41 adults participated (mean (standard deviation (SD)) age: 47.0 years (11.6); median EDSS: 2 (range: 0–7)); 37 required no in-home assistance for the tele-EDSS evaluation (e.g. help positioning camera). Mean difference between EDSS and tele-EDSS was 0.34 (95% confidence interval (CI): 0.07–0.61). For 88% of evaluations, tele-EDSS and EDSS scores were within 1 point (similar to reported inperson inter-rater differences). Unweighted kappa for agreement within 0.5 point was 0.72. Correlation for individual functional systems (FS) ranged from modest (vision: 0.37) to high (bowel/bladder: 0.79). Overall correlation between EDSS and tele-EDSS was 0.89 ( $p < 0.0001$ ); and 0.98 ( $p < 0.0001$ ) at EDSS range: 4–7.”

#### **Televideo platform:**

- Recommend a platform that can be accessed via smartphone, tablet or desktop (e.g. Zoom)
- Helpful preparation slides for patients can be found in resources section below

#### **Patients are instructed to have the following items for the examination, clinicians should have the same for demonstration:**

- Rosenbaum near card, can mail or download and print from file in resources section below
- Red color paper or card for red desaturation vision testing
- 1 wooden cotton swab (Q tip) OR 1 safety pin and 1 plastic Q-tip (or tissue) for sensory testing
- 5 pound weight or equivalent (food cans, books in a bag with handles)
- Free Smartphone app for vibration: [‘iMessage U’ app \(iPhone\)](#) or [‘Massager Vibration’ app \(Android\)](#)
- A pen light, flashlight, smartphone/tablet light, or small movable table lamp

#### **The Evaluation:**

##### **General Interim History:**

Ask patient:

- Any new symptoms in past year (or since last seen)? If so, what were they and how long did they last?
- Any prior baseline either episodic or continuous symptoms as part of their MS? If so, are these continuing at about the same frequency and severity?

Add general comment box for history

**VISUAL**

Ask patient to assess each eye separately for:

- **Visual acuity:** What is the smallest number series correctly read with Rosenbaum near card 14 inches away, while wearing corrective lenses?
- **Red desaturation:** Is the intensity/richness of red card color the same R and L?
- **Visual fields and scotoma:** Does the patient report any blind spots? Can the patient see their moving 2<sup>nd</sup> digit of both hands in all parts of the visual fields?

**BRAINSTEM**

- Ask patient to sit close to and directly in front of their computer camera: have patient move eyes quickly right, left, up and down:
  - Are the eye movements full?
  - Is there any nystagmus?
- Ask patient to compare sensation first to light touch (Q-tip or tissue) and then to pin on the right and left forehead, cheek and chin
- Ask the patient to close eyes tightly, open them wide, frown and show teeth
- Can the patient hear their own finger rub equally well at each ear? Can they hear your whisper?
- Does the patient have difficulty swallowing? If so, for solids, liquids or both?
- Does the patient's speech sound dysarthric? Stick tongue out, wiggle R and L.
  - If needed, have patient shine their flashlight or equivalent towards the back of their throat

**PYRAMIDAL**

- **Upper extremities.** Ask patient to sit about 5 feet from the computer screen or smartphone so that the upper extremities can be examined.
- When distinguishing a BRMC score of 4 from 5, the following can be helpful:
  - Is there any pronator drift of the arms outstretched with palms up?
  - How fast can the patient tap the thumb and forefinger, first R hand, then L?
  - Using a 5-lb weight or equivalent, ask the patient to repetitively use the deltoid, biceps, triceps and wrist extensors and flexors; observe and also ask patient if strength feels normal and equal
- **Lower extremities.** Ask patient to stand about 8 feet from the computer screen with the camera angle directed lower so that the lower extremities can be examined.
- When distinguishing a BRMC score of 4 from 5, the following can be helpful:
  - Holding on to a nearby chair or table for balance if necessary:
    - Lift the left leg up off the ground and get up and down repetitively on the *ball* of the right foot. Then repeat this maneuver lifting up the right leg and getting up on the ball of the left foot.

- Lift the left leg up off the ground and get up and down repetitively on the *heel* of the right foot. Then repeat this maneuver lifting up the right leg and getting up on the heel of the left foot
- Sit on a chair and stand up without using their arms
- Standing on both legs, do partial squats (partial deep knee bends) and if done well, unilateral partial deep knee bends, first with right leg, then with left leg.
- While standing, raise one knee toward chest (hold on to stationary object for balance); repeat with other leg.
- If possible, lay comfortably face up on either the floor or a couch, and then to lift up both legs and hold them up
- Toe taps: keeping the heel of 1 foot on the ground, tap the toes and ball of that foot as fast as possible. Then repeat this with the other foot.
- Hopping: If possible and safe, hop on one leg 11 times and then repeat with other leg
- Walk:
  - Normally across room, assess for gait spasticity
  - Walk across the room on their toes, and then on their heels

## CEREBELLAR

Ask patient to:

- While seated, outstretch both arms towards the camera. Bring one index finger quickly to touch their nose, then stretch the arm so the finger almost touches the camera; repeat several times. Then repeat using the other arm.
- Do rapid alternating taps of right palm onto left wrist; then repeat with left palm on right wrist
- Do heel to shin maneuver
- If gait is stable and low risk of falls:
  - Place one foot in front of the other and do a tandem (tight rope) walk
  - Stand near wall (or other stable structure) with feet close together and close eyes (Romberg)

## SENSORY

Ask patient: Are there persistent or episodic paresthesiae at other times in their arms/trunk/legs? (Score if MS relevant)

Then ask patient to:

- Use cotton swab (Q-tip) or tissue to lightly touch the right upper arm, hand, knee and foot and compare to the left
- Use safety pin or sharp edge of broken wooden cotton swab to lightly touch the right upper arm, hand, knee and foot and compare to the left
- Test vibration using the free smartphone app that makes the phone vibrate

- To test distal joint of 2<sup>nd</sup> digit of each hand, place phone on table and press the dorsal surface of distal forefinger down on phone; is the vibration felt with right hand? With left hand? To the same degree?
- To test to dorsum of each great toe, place foot flat on floor, place phone on top of great toe and hold phone with a cushion or towel so the vibration is not felt in the hand holding the phone. Is the vibration felt in each great toe? To the same degree?

## **BOWEL/BLADDER**

Ask patient:

- Any bladder symptoms such as hesitancy, urgency or episodes of loss of control? Use of pads? Use of catheters? Use of bladder medications?
- Any bowel symptoms such as constipation or loss of control? Use of pads? Use of laxatives or other bowel medications?

## **CEREBRAL**

Ask patient

- Any memory difficulties?
- Any mood changes such as irritability, anxiety, depression or elevated mood?
- Any fatigue? If so, is it always there or does it come and go? Is it bad enough to affect their ability to do more than one-half of their usual activities, less than one-half of them or it is just a bother?

## **AMBULATION INDEX (If possible, this can be assessed in advance by coordinator).**

Ask patient

- When you go out, do you use any assistive devices to walk? Can you walk as far as you'd like to, or do you need to rest at a certain point?
  - [If unlimited] About how far would that be?
  - [If limited] Let's say we are starting at your home. What is your home address? To what landmark from your home can you walk before needing to stop and rest?
    - Determine distance <https://www.google.com/maps>
    - Convert to meters <http://www.metric-conversions.org/length/miles-to-meters-table.htm>

Non-scoring additional related questions:

Current DMT

Recent relapse history