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Minds Advancing Medicine

Clinical Applications of the NIHSS

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**I do not have any conflict of interest
to report.**

Objectives:

- Describe the purpose of the NIHSS
- Discuss updates to the NIHSS
- Describe the limitations of the NIHSS
- Apply the NIHSS to different case scenarios

What it is:

- The National Institutes of Health Stroke Scale (NIHSS) was originally developed in 1989 as a means of measuring baseline data for patients involved in acute stroke clinical trials.

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- Standardized and repeatable assessment of stroke patients
 - High intra/interobserver reliability- ability of the measure to produce the same results when used by different individuals.
 - Clinical research and communication tool
 - Can predict stroke severity & outcomes

Uses

The NIHSS has grown to near universal use for:

- It is the standard scale used to evaluate the acute stroke patient for fibrinolytic therapy.
- To assess poststroke function
- and change in neurological function.

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- It allows us to quantify our clinical exam
 - It provides with risk assessment effectively

Limitations

- It is NOT a complete neurological evaluation & does not substitute for one
- Will miss some posterior circulation strokes, will miss small isolated cortical strokes (i.e. strokes which affect only the hand/fingers)

NIHSS Components

Components:

- 15 item scoring system
- Integrates neurologic exam components
- LOC, CN (visual), Motor, Sensory, Cerebellar, Language, Inattention
- Maximum score is 42, meaning severe stroke
- Minimum score is 0, a normal exam
- Scores >15-20 are more severe

LOC responsiveness

0-3 pts

- 0 Alert
 - 1 Drowsy/Lethargic (arousable by minor stimulation)
 - 2 Stuporous (requires repeated stimuli)
 - 3 Comatose (reflex responses only)
- A 3 is scored only if the patient makes no movement (other than reflexive posturing) in response to noxious stimulation
- Always start with the least noxious form of stimulation

LOC questions 0-2 pts

- “What month is it? How old are you?”
 - 0 Both correct
 - 1 One correct
 - 2 Incorrect
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- The answer must be correct-there is no partial credit for being close.
 - Aphasic and stuporous patients who do not comprehend the question will score a 2.
 - Aphasic patient may write answer or can be given yes/no questions
 - Patients unable to speak because of any other problem not related to aphasia are given a 1. (intubated patients)

LOC commands 0-2 pts

- “Open and close your eyes. Grip and release your hand.”
- 0 Obeys both correctly
- 1 Obeys one correctly
- 2 Incorrect
- Substitute another one-step command if the hands cannot be used.
- Credit is given if an unequivocal attempt is made but not completed due to weakness
- If patient does not respond to commands, the task should be demonstrated to him (pantomime), and the result scored.
- Comatose patients score a 2
- **LOC** **7 pts total**

Cranial Nerves (CN)- Best Gaze 0-2 pts

- 0 Normal
 - 1 Partial gaze palsy
 - 2 Forced deviation
- Only horizontal eye movements are tested.
 - Voluntary or reflexive eye movements (oculocephalic) will be scored.
 - If the patient has an isolated gaze palsy, the score will be 1.
 - Perform oculocephalic maneuver for comatose patients (assessing for brainstem function, CNs 3, 6, 8)

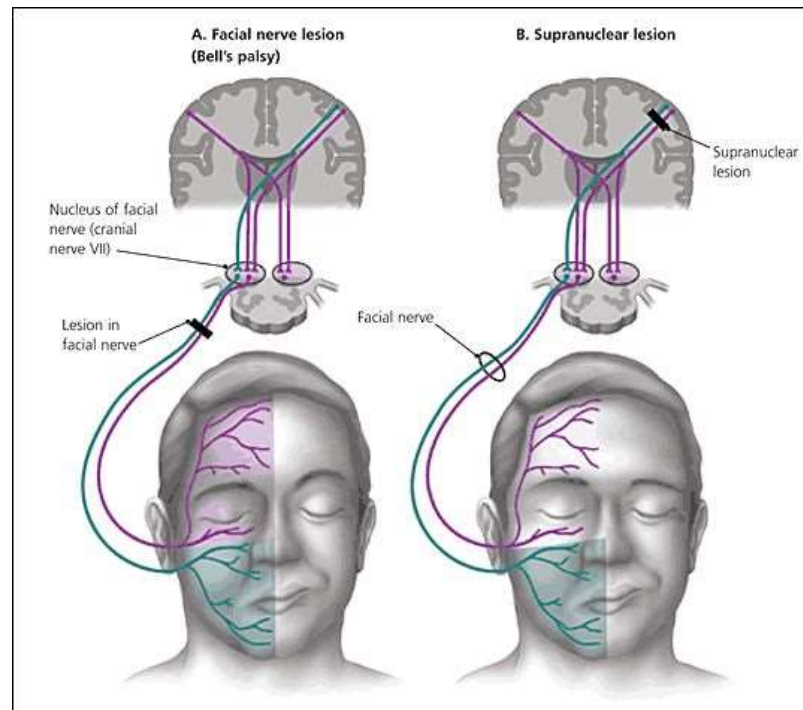
CN-Visual Field 0-3 pts

- 0 No loss
 - 1 Partial hemianopia
 - 2 Complete hemianopia
 - 3 Bilateral hemianopia (blind including cortical blindness)
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- Use blink-to-threat for aphasic or comatose patients.
- Score a 3 if patient is blind from any cause.

CN-Facial Palsy 0-3 pts

- “Show me your teeth. Raise your eyebrow. Close your eyes.”
 - 0 Normal
 - 1 Minor asymmetry
 - 2 Partial (lower face paralysis)
 - 3 Complete (absence of facial movement in the upper and lower face)
- Ask or use pantomime to encourage the patient.
- **CN** **8 points total**

Facial Palsy



Motor 0-4 pts

- Motor-each arm 0-4 pts
 - Extend the arm 90° (if sitting) or 45° (if supine). Drift is scored if the arm falls before 10 seconds.
- Motor-each leg 0-4 pts
 - Hold the leg at 30° (always tested supine). Drift is scored if the limb falls before 5 seconds.
 - 0 No drift
 - 1 Drift
 - 2 Some effort against gravity
 - 3 No effort against gravity
 - 4 No movement
 - 5 Untestable (amputation or joint fusion)- DO NOT add to final score

Motor: **16 points total**

Cerebellar-Limb Ataxia 0-2 pts

- The finger-to-nose and heel-to-shin are performed in both sides and ataxia is scored *only if present* out of proportion to weakness.
- 0 Absent
- 1 Present in upper or lower
- 2 Present in both
- Score a 0 if the patient cannot understand or is paralyzed.
- **Cerebellar** **2 points total**

Sensory 0-2 pts

- Test as many body areas as needed to for hemisensory loss (arms, legs, face, trunk).
 - 0 Normal
 - 1 Partial loss
 - 2 Dense loss
- A score of 2 should only be given when a severe or total loss of sensation can be clearly demonstrated.
- *Aphasic patients who cannot differentiate pinprick to demonstrate sensory loss will score a 0.*
- Patients in a coma are scored a 2.
- Sensory 2 points total**

Language-Aphasia 0-3 pts

- 0 No Aphasia
 - 1 Mild-moderate aphasia
 - 2 Severe Aphasia
 - 3 Mute
- If visual loss interferes with the test, ask the patient to identify objects placed in the hand, repeat, and produce speech.
 - The intubated patient should be asked to write.
 - The patient that is in a coma, is mute, or follows no one-step commands will score a 3.

Language-Aphasia

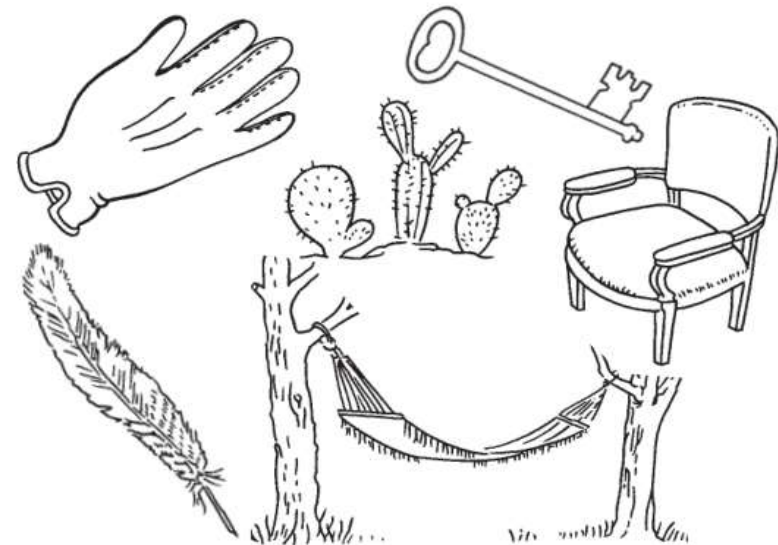
- To evaluate the best language of a patient, the examiner of the NIHSS asks the patient to describe a picture,
- to read words and sentences written on a card, and to identify the names of items

Out with the Old

Cookie theft picture



Items to name



In with the new

The Precarious Painter



Why the change?

- inclusive set of stimuli, easily recognized worldwide, to support more consistent interpretation globally.
- Items such as the mouse, a cloud, and a leaf are more recognizable worldwide
- More culturally appropriate scenarios avoiding stereotypical gender roles.

Language-Dysarthria 0-2 pts

- 0 Normal articulation
 - 1 Mild-moderate slurring
 - 2 Severe, nearly unintelligible or worse
- If the patient is intubated record the score as untestable.
- *For the aphasic or mute patient who cannot repeat words, score a 2*
- **Language 5 points**

Inattention 0-2 pts

- 0 No abnormality
 - 1 Partial neglect (visual, tactile, auditory, spatial, or personal inattention)
 - 2 Profound neglect (does not recognize own hand or orients to only one side of space)
- Observe for lack of awareness with visual or tactile stimulus
 - Comatose patients score a 2
- **Inattention 2 points total**

Case Scenarios

Case #1

Assessing treatment response

71 yo female...Patient to ED with medics. Got up to shower around 0500. After 0600, the patient was found on kitchen floor by family with right side flaccid, left gaze, and aphasic.

CTA: IMPRESSION:
Occlusion near origin of dominant
superior M2 division of left middle
cerebral artery.

Initial NIHSS score

NIH Stroke

Level of Consciousness : 2 - Not alert, requires repeated stimulation to attend

Questions

Month and Age : 2 - Answers neither correctly

Commands

Open and Close Eyes/Make fist, let go : 2 - Performs neither task correctly

Motor Function Left Arm : 2 - Some effort against gravity

Motor Function Right Arm : 3 - No effort against gravity

Motor Function Left Leg : 2 - Some effort against gravity

Motor Function Right Leg : 3 - No effort against gravity

Best Language : 3 - Mute, global aphasia

Dysarthria : 0 - Normal

NIH Score : 19

Patient was treated with fibrinolytic therapy and underwent thrombectomy



NIHSS 4 days later

NIHSS Stroke

Level of Consciousness : 1 - Not alert, but arousable

Questions

Month and Age : 1 - Answers 1 question correctly

Commands

Best Language : 1 - Mild-to-moderate aphasia

NIH Score: 3

Case #2

Assessing disability

- 65 yo male...presents to the ED with acute onset of dizziness, unsteady gait and right vision deficit at around 6pm while making dinner. Per patient's wife she heard him fall and was unable to assist him up.

Initial NIHSS score

- **NIHSS Score**
Visual Field Testing : 2 - Complete hemianopia

NIH Score : 2

Patient was treated with fibrinolytic therapy

NIHSS 2 days later

- NIHSS Score

Visual Field Testing : 1 - Partial hemianopia

Case #3

Assessing change in neuro exam

- 80 yo female...presented with inability to speak. Last known well time was more than 4.5 hours before ED arrival.
- CTA showed a left MCA occlusion with preserved brain tissue
- Patient was taken to CNI for thrombectomy

Initial NIHSS score

- *LOC Questions*
Month and Age : 2 - Answers neither correctly
- *LOC Commands*
Open and Close Eyes/make a fist, let go : 2 - Performs neither task correctly
- *Best Gaze* : 1 - Partial gaze palsy, gaze not normal
- *Facial Palsy* : 1 - Minor paralysis
- *Motor Function Right Arm* : 1 - Drift
- *Motor Function Right Leg* : 1 - Drift
- *Sensory* : 1 - Mild to moderate sensory loss
- *Best Language* : 2 - Severe aphasia
- *Dysarthria* : 0 - Normal

NIH Score : 11

7 days later

- **RN documents:** *Noted R sided upper extremity drift and weak grip for 0400 neuro assessment. Patient had 4/5 strengths in b/l upper extremities on previous neuro assessments---RN calls the Medical Resident*
- **M.R. documents:** *Diminished strength right Arm compared to previous examination. I examined the Pt. She was able to hold her R Arm against gravity BUT with drifting. Handgrip strength 1/5. In previous Exam was NO drifting described, and as per nurse she used her right hand equal to the left hand.*

NIHSS 7 days later

- *LOC Questions*
Month and Age : 2 - Answers neither correctly
- *LOC Commands*
Open and Close Eyes/make a fist, let go : 2 - Performs neither task correctly
- *Facial Palsy* : 1 - Minor paralysis
- *Motor Function Right Arm* : 2 – some effort against gravity
- *Sensory* : 1 - Mild to moderate sensory loss (mentioned in initial NIHSS)
- *Best Language* : 3 - Mute
- *Dysarthria* : 2- severe, nearly unintelligible

NIH score: 13

Follow-up CTH

CTH IMPRESSION:

1. Parenchymal hematoma centered in the left basal ganglia **increasing in size** as compared with 5 hours ago.
2. Parenchymal hematoma in the left temporal lobe, stable.
3. Increasing midline shift and medial displacement of the uncus but no frank herniation as yet.
4. Hemorrhagic transformation and subarachnoid hemorrhage throughout the distribution of the left middle cerebral artery, comparable to the extent of the perfusion deficit seen on CT perfusion 8/3/2022

NICU Upgrade Note

- Neurologic: *ICH, neurosurgery consulted for hydrowatch, repeat CT head in one hour per neurosurgery. Maintain HOB greater than 30 degrees. Discontinue aspirin and subq heparin. Holding statin, elevated LFTs.*

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Thank you

