

**The Neurological Exam
in the Emergency Department:
A Focus on Stroke Patients**

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Global Objectives

- Improve pt outcome in stroke
- Know how to do a useful neurological exam
- Know how to use the NIHSS to guide Rx
- Provide rationale ED use of tPA
- Allow for useful documentation
- Improve Emergency Medicine practice

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Session Objectives

- Present a relevant patient case
- Examine the NIHSS & simplify its use
- Detail the neurological exam in the ED
- Review ED documentation
- Discuss consent documentation
- Look at the patient outcome and ED documentation

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Clinical History

A 62 year old female acutely developed aphasia and right sided weakness while in the grocery store. The store clerk immediately called 911, with the arrival of CFD paramedics within 9 minutes, at 6:43 pm. She arrived at the ED at 7:05 pm, completed her head CT at 7:25 pm, and obtained a neuro consult at 7:35 pm, approximately one hour after the onset of her symptoms.

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ED Presentation

On exam, BP 116/63, P 90, RR 16, T 98, 99%. The patient appeared alert, and was able to slowly respond to simple commands. The patient had a patent airway, no carotid bruits, clear lungs, and a regular cardiac rate and rhythm. The pupils were midpoint and reactive, and there was neglect of the R visual field. There was facial weakness of the R mouth, and R upper and lower extremity motor paralysis. DTRs were 2/2 on the left and 0/2 on the right. Planter reflex was upgoing on the right and downgoing on the left. The patient's estimated weight was 50 kg.

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Why Do This Exercise?

- The NIHSS is the industry standard
- It allows us to quantify our clinical exam
- Neurological exam must be systematic
- Documentation of tPA discussions is key
- These efforts improve patient care, minimize risk, and enhance clinical practice

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Key Clinical Questions

- How is the NIHSS used?
- How can an ED NIHSS be estimated?
- How can the ED neurological exam be systematically performed & documented?
- What must be documented when considering tPA use in the ED?
- How can ED patient Rx be optimized?

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NIH Stroke Scale

- 13 item scoring system, 7 minute exam
- Integrates neurologic exam components
- CN (visual), motor, sensory, cerebellar, inattention, language, LOC
- Maximum scale score is 42
- Maximum ischemic stroke score is 31
- Minimum score is 0, a normal exam
- Scores > 15-20: severe stroke

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NIHSS Suggestions

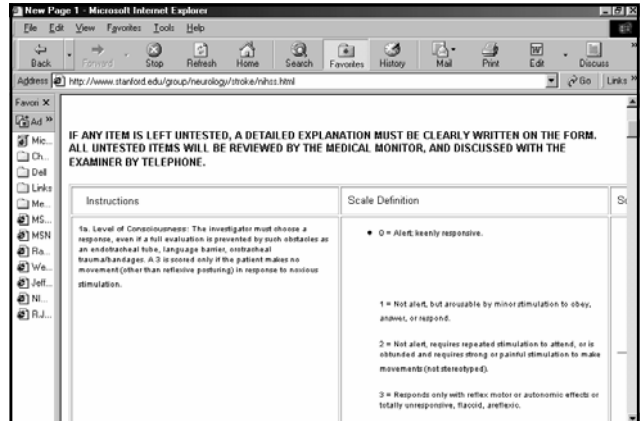
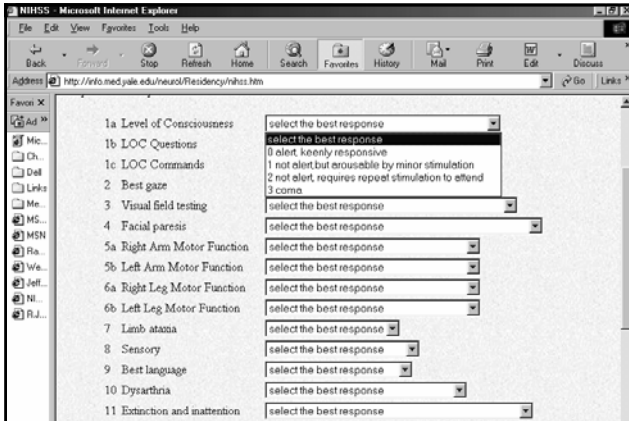
- Know the NIHSS general categories
- Let these 7 areas guide your exam
- Know how to approximate an NIHSS
- Use the web to fully score NIHSS prn

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NIHSS Internet Calculator

- Allows calculation on-line
- Will add values, provide total
- <http://info.med.yale.edu/neuro/Residency/nihss.htm>
- Other sites:
 - www.stanford.edu/group/neurology/stroke.nihss.html
 - www.thebraincentre.org/NIHSS/NIHSS.htm

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NIHSS: LOC

- LOC overall 0-3 pts
- LOC questions 0-2 pts
- LOC commands 0-2 pts

- LOC: 7 points total



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NIHSS: Cranial Nerves

- Gaze palsy 0-2 pts
- Visual field deficit 0-3 pts
- Facial motor 0-3 pts

- Gaze/Vision/
Cranial nerves: 8 points total



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NIHSS: Motor

- Each arm 0-4 pts
- Each leg 0-4 pts

- Motor: 8 points total
(8 right, 8 left)



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NIHSS: Cerebellar

- Limb ataxia 0-2 pts


- Cerebellar: 2 points total



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NIHSS: Sensory

- Pain, noxious stimuli 0-2 pts
- Sensory: 2 points total

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NIHSS: Language

- Aphasia 0-3 pts
- Dysarthria 0-2 pts
- Language: 5 points total

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NIHSS: Inattention

- Inattention 0-2 pts
- Inattention: 2 points total

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NIHSS Composite

- CN (visual): 8
- Unilateral motor: 8
- LOC: 7
- Language: 5
- Ataxia: 2
- Sensory: 2
- Inattention: 2

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Four Main NIHSS Areas

- CN/Visual: Facial palsy, gaze palsy, visual field deficit
- Unilateral motor: Hemiparesis
- LOC: Depressed LOC, poor responsiveness
- Language: Aphasia, dysarthria, neglect
- 28 total points

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NIHSS ED Estimate

- CN (visual): 8
- Unilateral motor: 8
- LOC: 8
- Language/Neglect: 8
- Mild: 2, Moderate: 4, Severe: 8
- +/- Incorporates other elements

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Case NIHSS Estimate

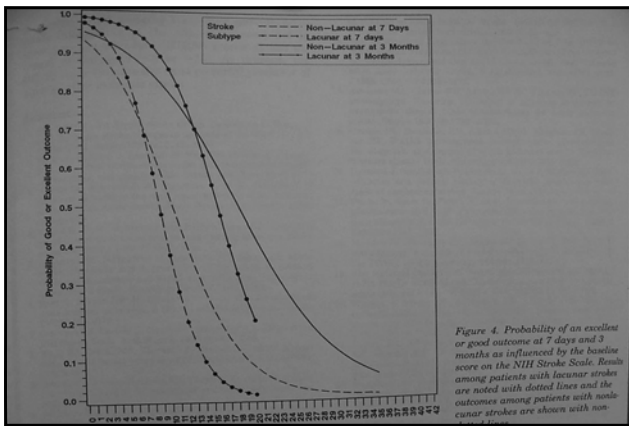
- CN/Visual: R vision loss, no fixed gaze 4
 - Unilateral motor: hemiparesis 8
 - LOC: mild decreased LOC 2
 - Language: speech def, neglect 4
- Approx 18 points total
 - Severe stroke range, worse if MS impaired

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NIHSS & Outcome

- Does the baseline NIHSS predict outcome?
- Yes.
- Adams HP Neurology 1999;53:126-131
- Baseline NIH Stroke Scale score strongly predicts outcome after stroke (TOAST)

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NIHSS & Outcome

- NIHSS < 12-14: 80% good, excellent outcome
- NIHSS > 20-26: < 20% good, excellent outcome
- Lacunar infarct patients: best outcomes.
- Adams HP Neurology 1999;53:126-131
- Baseline NIH Stroke Scale score strongly predicts outcome after stroke (TOAST)

Retrospective NIHSS Use

- Can the NIHSS and other scores be determined retrospectively?
- Yes.
- Goldstein LB, Stroke 1997;28:1181-1184.
- Retrospective Assessment, Canadian Neurologic Scale
- Williams LS, Stroke 2000;31:858-862
- Retrospective Assessment with the NIHSS

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Retrospective NIHSS Use

- These scales can be determined in retrospect if adequate documentation of the neurological exam is in the ED record
- Implications for CQI and individual cases in which tPA use is considered
- Goldstein LB, Stroke 1997;28:1181-1184.
- Retrospective Assessment with the Canadian Neurologic Scale
- Williams LS, Stroke 2000;31:858-862
- Retrospective Assessment with the NIHSS

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The Neurological Exam in ED Stroke Patients

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Stroke Pt History

- When did symptoms begin? Onset?
- Prior history of similar symptoms?
- When was the patient last seen normal?
- Risk factors?
- History that would preclude tPA use?

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Stroke Physical Exam

- Vital signs, pulse ox, POC glucose
- HEENT: Pupils, papilledema, airway
- Neck: Bruits, nuchal rigidity
- Chest: Rales (CHF, aspiration)
- Cardiac: AFib, Gallops, murmurs

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Stroke Physical Exam (Con't)

- Abd: Evidence of AAA
- Ext: Evidence of CHF, DVT
- Skin: Evidence of infection
- Neuro: CN, motor, sensory, reflexes, cerebellar, visual, language, neglect, mental status

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Cranial Nerve Exam

- Is there mouth droop, lid weakness?
- CN: Anterior vs. brainstem?
 - Anterior: Contralateral CN deficit
 - Brainstem: Ipsilateral CN deficit
- CN: Eye motor (Bell's)

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Motor Exam

- Is there hemiparesis & how severe?
- Motor: Upper & lower ext
 - Upper: Pronator drift, pull fingers out of hand
 - Lower: Leg lift, hip flexion push against hand

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Sensory Exam

- Is there a loss of light touch?
- Sensory: Light touch, pinprick graphesthesia

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Reflex Exam

- Are there pathologic reflexes?
- Is there a gag reflex?
- Normal vs. pathologic
 - Normal: Corneals, gag, DTRs
 - Pathologic: Babinski, Chaddock
 - Dec LOC, loss of airway control
 - Loss of UMN control

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Cerebellar Exam

- Is finger to nose, heel to shin OK?
- Can the patient sit in the cart?
- Extremity motor cerebellar function
- Truncal ataxia and ataxic gait
- Positive Romberg

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Visual/Neglect Exam

- Does the patient gaze to one side?
- Is there a loss of vision on one side?
- Does the patient neglect one side?
- Persistent gaze to side of ischemic CVA
- Homonymous hemianopsia
- Neglect of one side

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Language Exam

- Is the patient dysarthric?
- Does the patient have an aphasia?
- Dysarthria: Poor mouth motor function
- Aphasia: Disturbed language processing
 - Expressive: can't speak the right words
 - Receptive: can't process what is heard

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Mental Status Exam

- Is there an alteration in mental status?
- Level of consciousness (AVPU)
 - Alert
 - Responds to verbal
 - Responds to painful
 - Unresponsive
- Glasgow Coma Scale Score

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Clinical Case: ED Rx

- CT: no low density areas or bleed
- No contraindications to tPA, BP OK
- NIH stroke scale: approx 18-20
- Neurologist said OK to treat
- No family to defer tPA use
- tPA administered, no complications

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tPA Use & Repeat Exam

- tPA dosing:
 - 8:21 pm, approx 1'45" after CVA sx onset
 - Initial bolus: 5 mg slow IVP over 2 minutes
 - Follow-up infusion: 40 mg infusion over 1 hour
- Repeat neuro exam at 90 minutes:
 - Repeat Exam: Increased speech & use of R arm, decreased mouth droop & visual neglect
 - Repeat NIH stroke scale: approximately 12-14

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ED tPA Documentation

- With tPA, there is a 30% greater chance of a good outcome at 3 months
- With tPA use, there is 10x greater risk of a symptomatic ICH (severe bleeding stroke)
- Mortality rates at 3 months are the same regardless of whether tPA is used
- What was the rationale, risk/benefit assessment for using or not using tPA?
- What was done to expedite Rx and to consult neurology and radiology early on?

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ED tPA Documentation

- Patient was explained risks and benefits of tPA use and was able to understand and provide verbal consent (as able), and signature with L hand.
- Risk/benefit favored tPA given clear onset time, young patient with no significant morbidities or factors that would preclude tPA use, and approx NIHSS that suggests OK use.
- Rapid CT obtained, neurology aware of pt status, agreed with expedited tPA use, to follow.

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Hospital Course & Disposition

- Hospital Course: No hemorrhage, improved neurologic function
- Disposition: Rehabilitation hospital
- 3 Month Exam: Near complete use of RUE, speech & vision improved, slight residual gait deficit
- Able to live at home with assistance

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Key Learning Points

- The NIHSS tests neuro exam in 4 key areas
- An ED NIHSS can be estimated using an 8 point scale (M/M/S) in these 4 areas
- By clearly stating and writing what is observed, the physical and neurological exam of the ED stroke patient can be systematically obtained and documented
- This allows the NIHSS to also be retrospectively obtained, as needed

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Key Learning Points

- When considering the use of tPA in ED stroke patients, summary data from the NINDS trial must be explained, understanding of this data and the risks & benefits of tPA use by the patient and/or family, and the rationale for its use must be documented in the ED medical record
- Expedited ED care of the tPA-eligible stroke patient must be provided, included VS and airway Rx, rapid CT performance & interpretation, and early neurological consultation

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Questions??

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