

Use of the NIH Stroke Scale (NIHSS) in Emergency Department Patients with Acute Stroke

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Global Objectives

- Improve pt outcome in stroke
- Know how to use the NIHSS to guide Rx
- Provide rationale ED use of tPA
- Maximize outcome
- Minimize morbidity associated with tPA

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Session Objectives

- Examine the NIHSS
- Simplify its calculation
- Ask clinically relevant questions
- Address important issues in literature
- Consider practical use in the ED

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Why Do This Exercise?

- The NIHSS is the industry standard
- It is not just a research tool
- It allows us to quantify our clinical exam
- It provides for standardization
- It manages risk effectively

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Neurologic Exam: NIH Stroke Scale

- 13 item scoring system, 7 minute exam
- Integrates neurologic exam components
- CN (visual), motor, sensory, cerebellar, inattention, language, LOC
- Maximum score is 42, signifying severe stroke
- Minimum score is 0, a normal exam
- Scores greater than 15-20 are more severe

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NIH Stroke Scale: Important Questions

- Which elements are consistently collected?
- Which correlate with outcome?
- Which improve with tPA?
- Which suggest a complicated tPA course?
- Which parts overlap with one another?
- Does the side of the stroke matter?

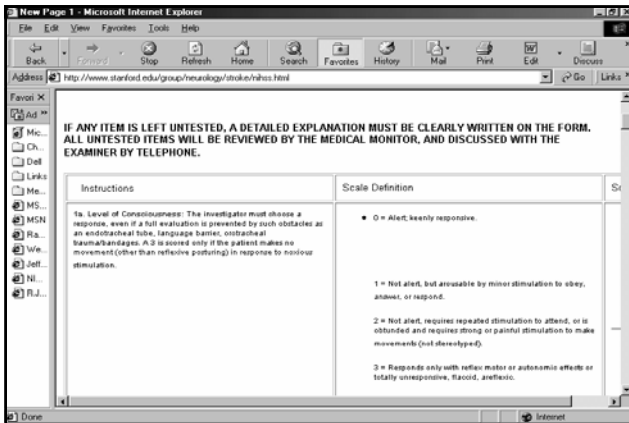
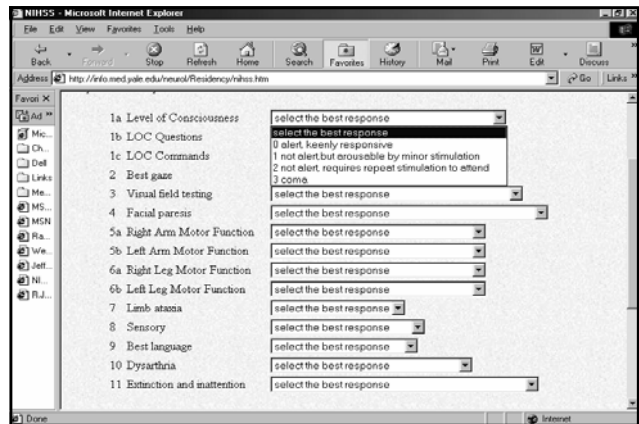
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NIH Stroke Scale: Practical Suggestions

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

NIH Stroke Scale: 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



NIHSS Elements: LOC

- LOC overall 0-3 pts
- LOC questions 0-2 pts
- LOC commands 0-2 pts
- LOC: 7 points total

NIHSS Elements: Cranial Nerves

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

- Cranial nerves: 8 points total

NIHSS Elements: Motor

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

- Motor: 16 points total
8 points right
8 points left

NIHSS Elements: Cerebellar

- Limb ataxia 0-2 pts

- Cerebellar: 2 points total

NIHSS Elements: Sensory

- Pain, noxious stimuli 0-2 pts

- Sensory: 2 points total

NIHSS Elements: Language

- Aphasia 0-3 pts
- Dysarthria 0-2 pts

- Language: 5 points total

NIHSS Elements: Inattention

- Inattention 0-2 pts

- Inattention: 2 points total

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NIHSS Elements: Composite

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

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NIHSS: Key Elements

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

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NIHSS Crude Estimate

- CN (visual): 8
- Unilateral motor: 8
- LOC: 8
- Language: 8


- Mild 2, Moderate 4, Severe, 8
- Incorporates other elements

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NIHSS Crude Estimate: Example

- CN (visual): some palsy 4
- Unilateral motor: hemiparesis 8
- LOC: mild decreased LOC 2
- Language: some speech 4

- 18 points total
- More severe decrease in LOC: caution!

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NIHSS Question: Prediction

- 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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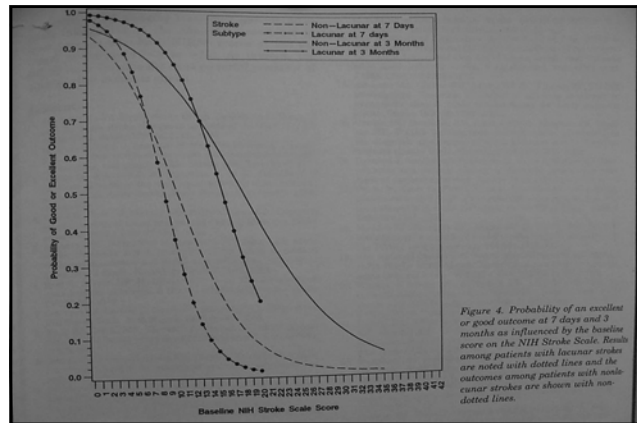
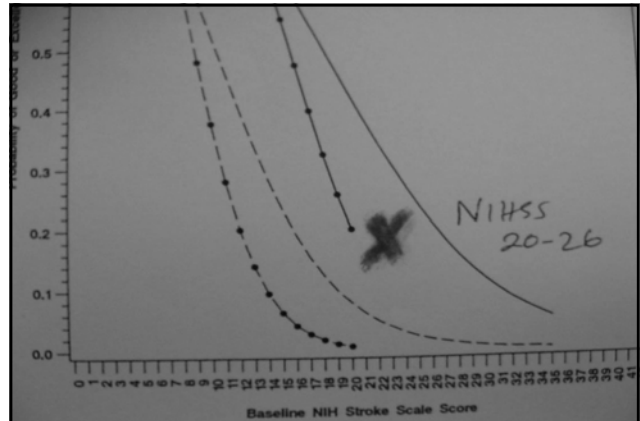
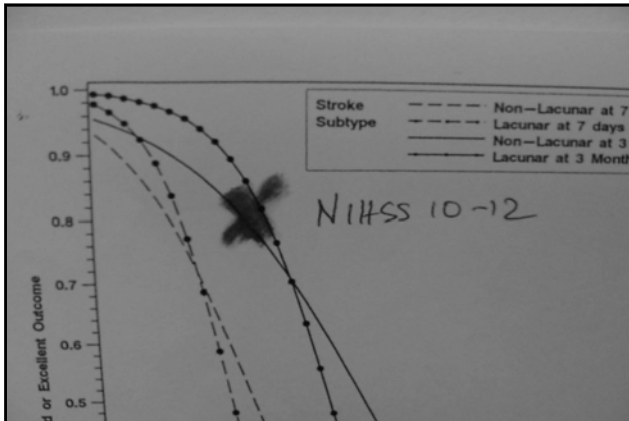


Figure 4. Probability of an excellent or good outcome at 7 days and 3 months as influenced by the baseline score on the NIH Stroke Scale. Results among patients with lacunar strokes are noted with dotted lines and the outcomes among patients with non-lacunar strokes are shown with non-dotted lines.

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NIHSS and Outcome Prediction

- NIHSS below 12-14 will have an 80% good or excellent outcome.
- NIHSS above 20-26 will have less than a 20% good or excellent outcome.
- Lacunar infarct patients had the best outcomes.

- Adams HP *Neurology* 1999;53:126-131
- Baseline NIH Stroke Scale score strongly predicts outcome after stroke (TOAST)

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NIHSS Question: NINDS Trial Data

- Did the NINDS trial show benefit across all baseline NIHSS strata? Based on stroke subtype?
- No and yes.

- NINDS rt-PA Stroke Study Group, *NEJM*1995;333:1581-7.
- Tissue plasminogen Activator for Acute Ischemic Stroke

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NIHSS and The NINDS Trial

- Regardless of stroke subtype (small-vessel occlusive, large-vessel occlusive or cardioembolic), there was benefit with tPA.
- There was no data that showed how benefit was related to baseline NIHSS.
- Only median NIHSS data was provided, and no other subgroup analysis was performed.

- NINDS rt-PA Stroke Study Group, *NEJM*1995;333:1581-7.
- Tissue plasminogen Activator for Acute Ischemic Stroke

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NIHSS Question: NINDS Placebo Pts?

- Did factors predict poor outcome of the placebo pts in the NINDS clinical trial? Should these pts still be treated with tPA?
- Yes and probably.

- Frankel MR, *Neurology* 2000;55:952-959.
- Predicting prognosis after stroke: Placebo group in the NINDS Stroke Trial

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Outcome of the NINDS Placebo Pts

- 96% PPV: pts with an NIHSS > 17 and afib will have a poor outcome.
- Same poor outcome with NIHSS > 17 and impaired consciousness.
- There was improvement with tPA use.

- Frankel MR, *Neurology* 2000;55:952-959.
- Predicting prognosis after stroke: Placebo group in the NINDS Stroke Trial

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NIHSS Question: Other Stroke Scales

- Do other stroke scales exist that are easier to use? Are they valid? Can they be used?
- Yes, yes, and no.

- Cote R, *Neurology* 1989;39:638-643.

- The Canadian Neurologic Scale
- Lyden PD, *Stroke* 2001;32:1310-1317.

- A Modified NIHSS for Use in Stroke Clinical Trials


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NIHSS and Other Stroke Scales

- Other scales do exist that may make calculating stroke severity easier.
- These other scales have been validated.
- The NINDS and other stroke trials have not indicated what the stroke severity was using these other scoring systems, such that we cannot infer this info and incorporate it into clinical practice.

- Cote R, *Neurology* 1989;39:638-643.
- The Canadian Neurologic Scale
- Lyden PD, *Stroke* 2001;32:1310-1317.

- A Modified NIHSS for Use in Stroke Clinical Trials

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NIHSS Question: Retrospective Use?

- Can these scales be determined retrospectively?

- Yes.

- 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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Retrospective Severity Scale Use

- These scales can be determined in retrospect if adequate documentation of the neurologic 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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NIHSS: Does CVA Side Impact Rx?

- Does it matter whether or not the stroke findings are on the right side or left side of the body?

- Yes.

- Woo D, *Stroke* 1999;30:2355-2359.

- Does the NIHSS Favor Left Hemispheric Strokes?

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CVA Symptom Side and Rx

- R sided stroke, L sided symptoms
- R sided stroke, non-dominant
- R sided stroke, inattention, 2 points

- L sided stroke, R sided symptoms
- L sided stroke, dominant
- L sided stroke, language, 5 points

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CVA Symptom Side and Rx

- A R sided stroke has a stroke the same size as a L sided stroke with an NIHSS that is 5 points higher.
- Perhaps we should treat R sided strokes (L sided paralysis) that have lower NIHSS.
- Perhaps we should treat higher L sided strokes (R sided paralysis) that have a higher NIHSS.
- In both cases, the motor score is often the same.

- Woo D, *Stroke*1999;30:2355-2359.
- Does the NIHSS Favor Left Hemispheric Strokes?

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NIHSS: Ant vs. Post Circulation?

- Should tPA be administered regardless of the type of stroke noted?

- Yes.


- Personal communication, Lewandowski, 2001.

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tPA in Posterior Circulation Strokes

- Up to 10-15% of pts in the NINDS stroke trial were posterior circulation strokes. These pts were randomized to receive tPA as were other stroke pts.
- There is no reason not to give tPA to these pts per the clinical trial protocol.

- Personal communication, Lewandowski, 2001.

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Use of the NIHSS: Conclusions

- The NIHSS must be approximated
- Scores above 17-20 impart greater risk
- tPA still must be considered, since benefit
- Stroke side, language must be considered
- A rough scale must be used, since no abbreviated scale validated

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Use of the NIHSS: Recommendations

- Risk/benefit based on baseline NIHSS
- Know how to quickly calculate (web)
- Document streamlined calculation
- Outcome can be optimized in this way
- Be familiar with “optimal” pt profile

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Optimal tPA Pt Using NIHSS

- Limited alteration in mental status
- Moderate to severe visual/CN defect, hemiparesis, and language, but not severe in all three
- NIHSS 16-20 maximum
- No atrial fibrillation

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Questions??

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