
**Stroke Patient and Stroke
Therapies Assessment:
ED NIHSS & Stroke Scales Use
for ED Stroke Therapies**

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Session Objectives

- Discuss how the NIHSS should be utilized by emergency physicians in assessing ischemic stroke patients in the Emergency department.
- Determine what emergency physicians need to know about stroke scales when evaluating stroke therapies that could be utilized in treating ED ischemic stroke patients.

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Case Presentation...


- 67 yo male transported as a "Code stroke" based on a positive Prehospital Stroke Screen
- Symptom onset 30 minutes before paramedic arrival
 - Left arm weakness, slurred speech and facial droop
- PMHx of hypertension
 - Admits to being non-compliant with his medications
- In the ED, alert with a right sided gaze preference and weakness of his left arm and face
- Accucheck is 97, BP 170/90 mm Hg

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Clinical Questions

- What is the role of the NIHSS in the evaluation of ED ischemic stroke patients?
- How should the NIHSS be used to assess the potential use of IV tPA in ED ischemic stroke patients?
- What are the Modified Rankin Scale and Barthel index, and what do they measure?

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Clinical Questions


- How have the NIHSS, MRS, and BI used as a measure of outcome in clinical trials of stroke therapies?
- How can the MRS and BI be used to determine the utility of stroke therapies in the ED?
- How can the number needed to treat calculation be performed based on these scales and study outcomes, and what does it mean to the clinical practice of Emergency Medicine?

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NIH Stroke Scale (NIHSS)


- First developed for acute stroke trials as a research study tool
- Standardized mechanism for defining stroke severity based on neurologic deficits
 - 15 item ordinal scale designed to rate neurological impairment
- Widely used in US clinical practice
- Helps to predict outcome with or without t-PA treatment
- Helps to assess risk of hemorrhage after t-PA treatment

Brott T et al. *Stroke* 1999;20:864-70.
 Goldstein LB et al. *Arch Neurol* 1999;46:660-2.
 Adams HP et al. *Neurology* 1999;53:126-31.
 Goldstein LB et al. *Arch Neurol* 1999;46:660-2.
 Muir KW. et al. *Stroke* 1996;27(10):1817-20.

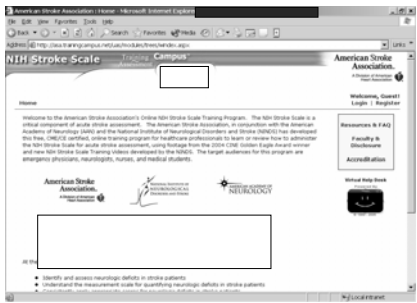
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NIH Stroke Scale

Item	Description	Range
1a	Level of Consciousness	0-3
1b	LOC Questions	0-2
1c	LOC Commands	0-2
2	Best Gaze	0-2
3	Best Visual	0-3
4	Facial Palsy	0-3
5	Motor Arm Left	0-4
6	Motor Arm Right	0-4
7	Motor Leg Left	0-4
8	Motor Leg Right	0-4
9	Limb Ataxia	0-2
10	Sensory	0-2
11	Neglect	0-2
12	Dysarthria	0-2
13	Best Language	0-3

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Online Certification Program Exists




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Reliability of NIHSS Items

Item	κ Range
1a. Level of consciousness	0.46 to 0.68
1b. LOC questions	0.44 to 0.94
1c. LOC commands	0.41 to 0.94
2. Gaze	0.33 to 0.82
3. Visual fields	0.57 to 0.90
4. Facial palsy	0.22 to 0.74
5. Arm strength	0.77 to 0.97
6. Leg strength	0.39 to 0.98
7. Limb ataxia	-0.16 to 0.69
8. Sensation	0.39 to 0.89
9. Language	0.60 to 0.84
10. Dysarthria	0.29 to 0.72
11. Extinction/ neglect	0.53 to 0.89

Abbreviations: κ , kappa; LOC, level of consciousness

Goldstein LB and Simek DL. *JAMA* 2005;293(19):2391-2402

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Reliability of the NIHSS: Analysis of Video Ratings

Patient	Median	5%, 95%	90% spread
10	1	0, 2	2
3	2	1, 4	3
8	2	1, 3	2
1	4	3, 6	3
6	5	3, 8	5
9	7	5, 9	4
7	7	5, 10	5
5	11	9, 14	5
2	17	15, 19	4
4	19	17, 23	6
1	31	26, 34	8

Josephson SA et al. ISC January 17, 2006 Andrew Asimos, MD, FACEP

Reliability of the NIHSS: Analysis of Video Ratings

NIHSS Question	Performance Measure	Observed Agreement	Kappa
1a	Level of consciousness	0.92	0.89
1b	LOC questions	0.90	0.85
1c	LOC Commands	1.0	0.99
2	Best Gaze	0.96	0.94
3	Visual Fields	0.94	0.92
4	Facial Palsy	0.74	0.65
5-6	Motor Limbs	0.88-0.97	0.84-0.97
7	Limb Ataxia	0.85	0.80
8	Sensation	0.97	0.96
9	Aphasia	0.70	0.60
10	Dysarthria	0.89	0.85
11	Extinction and Inattention	0.90	0.84

Josephson SA et al. ISC January 17, 2006 Andrew Asimos, MD, FACEP

Reliability of the NIHSS: Analysis of Video Ratings

- Conclusions
 - Substantial variability in the overall Stroke Scale score
 - High levels of agreement for many items does not necessarily translate into the total score being highly reliable
 - Facial palsy and aphasia items least reliably assessed
 - Physicians didn't score better than the other professionals
 - Reliability did not improve with testing experience

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Symptomatic ICH in NINDS: Effect of Baseline NIHSS

% of TPA Patients with Symptomatic ICH

Baseline NIH Stroke Scale Score	% of TPA Patients with Symptomatic ICH
0-5	~2%
6-10	~3%
11-15	~5%
16-20	~4%
>20	~17%

The NINDS/t-PA Stroke Study Group. Stroke 1997;28(11):2109-2118. Andrew Asimos, MD, FACEP

1 Year Follow-up of NINDS Study Patients: Effect of Baseline NIHSS

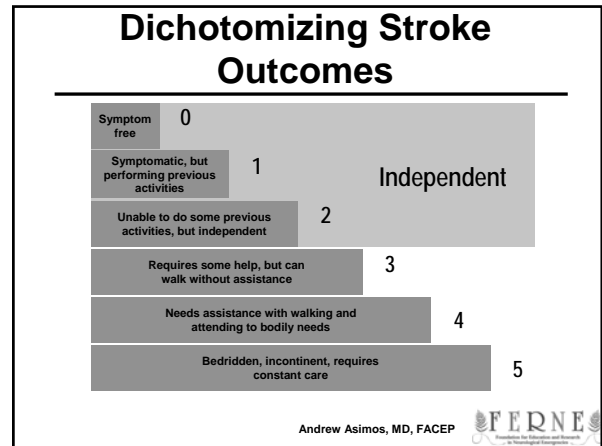
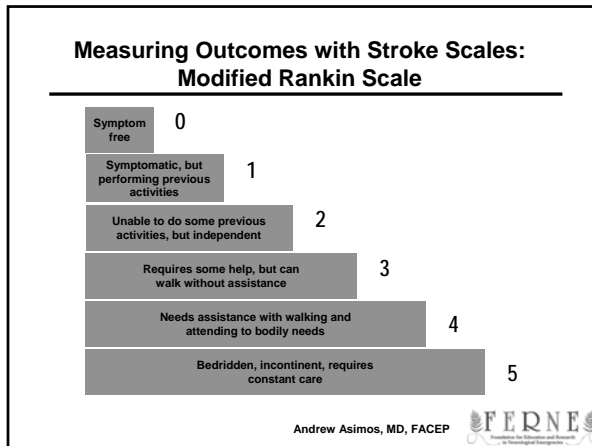
Presenting NIHSS Score	t-PA (%)	Placebo (%)
<9	~75	~70
10-14	~60	~40
15-20	~50	~25
>20	~15	~15

Kwiatkowski TG et al. N Engl J Med 1999;340:1781-7. Andrew Asimos, MD, FACEP

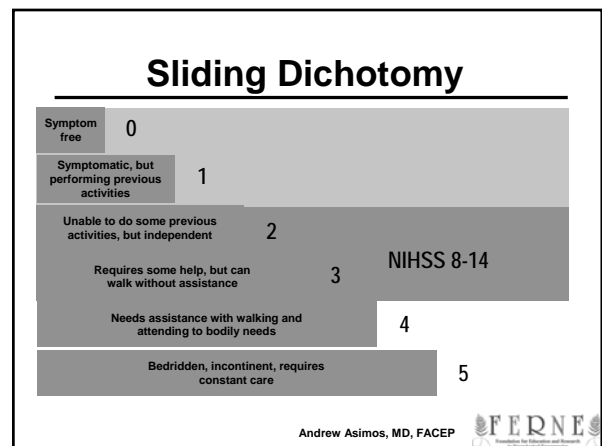
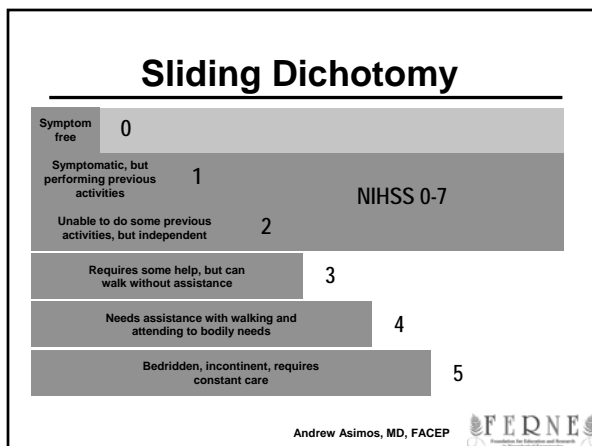
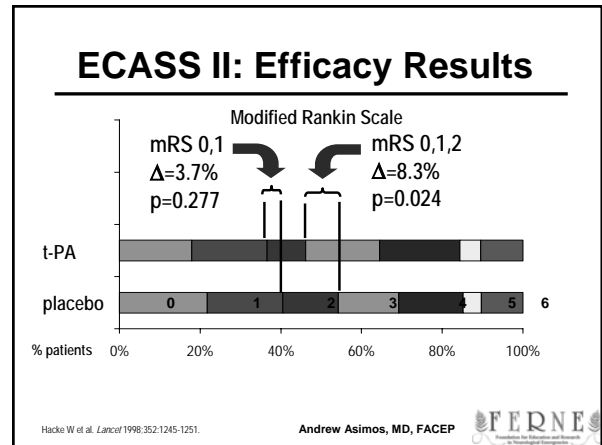
3 Month Outcome of TOAST Study Patients: Effect of baseline NIHSS

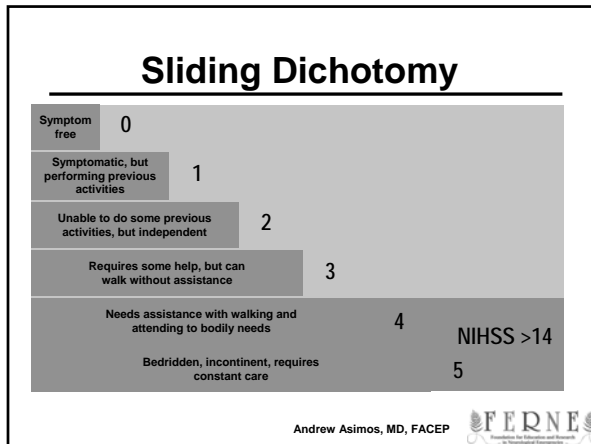
Baseline NIHSS Score	n	excellent (%)	good (%)	poor (%)	dead (%)
0-3 points	170	~10	~10	~80	~0
4-6 points	499	~10	~25	~65	~0
7-10 points	323	~10	~35	~55	~0
11-15 points	205	~10	~30	~60	~0
16-22 points	103	~15	~40	~45	~0
23+ points	059	~30	~50	~20	~0

Adams HP et al. Neurology 1999;53:126-31. Andrew Asimos, MD, FACEP

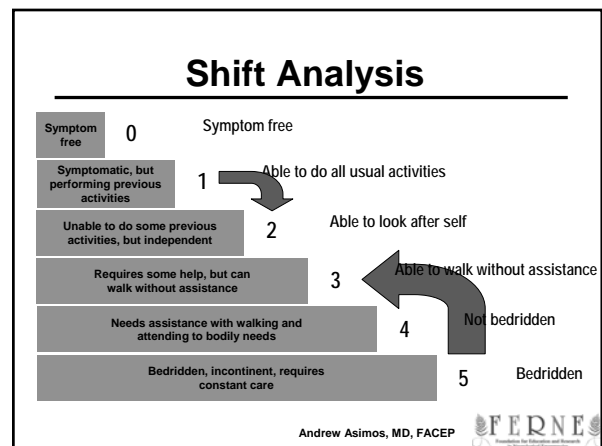
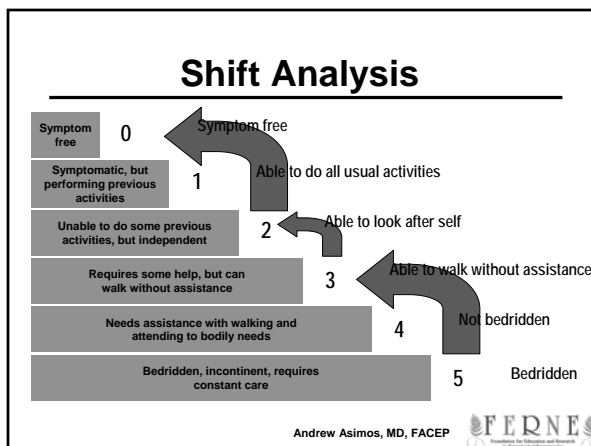
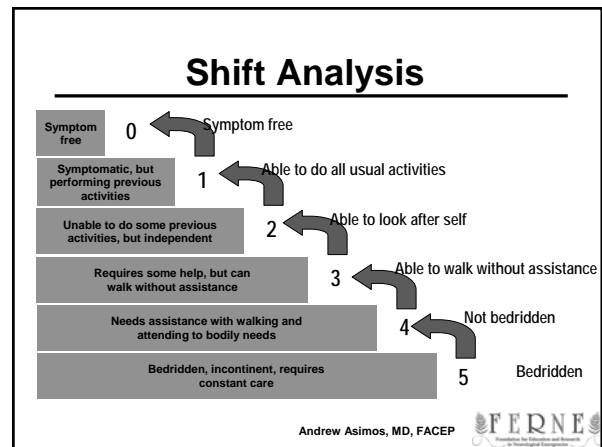
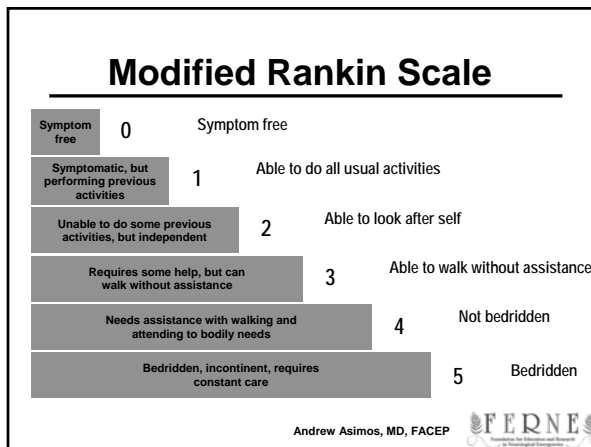


- ### Dichotomizing Stroke Outcomes
- Does the treatment make all patients achieve a "good" outcome?
 - Advantages
 - Simple statistical analysis
 - Straightforward clinical interpretation
 - Disadvantages
 - Functional continuum of stroke is broad
 - Eliminates some outcome information
 - Both directions
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- ### Sliding Dichotomy
- Does the treatment make the patient better based on the patient's initial status?
 - Advantages
 - Adjustment for baseline severity
 - Nor fixed target outcome inappropriate for mild or severe patients
 - Disadvantages
 - Still a dichotomous analysis
 - Potential to ignore harmful effects occurring at non-specified transitions
 - Requires estimate of treatment effect to identify outcome transitions
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Shift Analysis

- *Does the treatment make the patient somewhat better?*
- Advantages
 - Analyzes benefit or harm throughout the continuum of disability
 - Does not rely on an estimate of treatment effect to identify outcome transitions
- Disadvantages
 - Statistically complex
 - NNT calculations from theoretical models

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Conclusions

- The NIHSS helps to predict outcome, with or without t-PA treatment, and hemorrhage risk after t-PA treatment
- Different stroke study endpoint analyses have been applied to outcome scales, with each technique offering its own advantages and disadvantages
- Some stroke trials may have missed beneficial or harmful treatment effects because the criteria for judging treatment response were inappropriate for many of the patients studied

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Recommendations

- **Understand how to measure the NIHSS and the limitations of the score obtained**
- **Be knowledgeable of the stroke outcome scores used in trials and how the outcomes were analyzed**
- **Understand the fundamental questions that can be answered by each study endpoint analysis strategy**

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Questions?

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