

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

Edward P. Sloan, MD, MPH, FACEP 

Edward Sloan, MD, MPH

Professor

**Department of Emergency Medicine
University of Illinois College of Medicine
Chicago, IL**

Edward P. Sloan, MD, MPH, FACEP 

***Attending Physician
Emergency Medicine***

**University of Illinois Hospital
Our Lady of the Resurrection Hospital**

Chicago, IL

Edward P. Sloan, MD, MPH, FACEP 

Global Objectives

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

Edward P. Sloan, MD, MPH, FACEP 

Session Objectives

- Present a relevant patient case
- Examine the NIHSS & simplify its use
- Detail the neurological exam in the ED
- Assess what must happen to Rx ICH
- Review ED documentation

Edward P. Sloan, MD, MPH, FACEP 

Clinical History

A 76 year old male acutely developed aphasia and right sided weakness while eating at home. He seemed to slump over in his chair at the kitchen table, and was less responsive as he was guided to the floor by family. A call to 911 was immediately made. The paramedics reported a blood pressure of 220/118, and a GCS of 14 for this patient, who was aroused by verbal stimuli but seemed unable to speak clearly. The field glucose was 316. The patient had a history of DM and HTN.

Edward P. Sloan, MD, MPH, FACEP 

ED Presentation

On exam, BP 224/124, P 100, RR 16, T 98.8, and pulse oximetry showed 99% saturation. The patient was slightly somnolent, but was able to slowly respond to simple commands. The patient seemed to snore a bit when not stimulated. The patient had no carotid bruits, clear lungs, and a regular cardiac rate and rhythm. The pupils were midpoint, and there seemed to be neglect of the R visual field. There was facial weakness of the R mouth and R upper and lower extremities.

Edward P. Sloan, MD, MPH, FACEP



Key Clinical Questions

- How can an ED NIHSS be estimated?
- How can the ED neurological exam be systematically performed & documented?
- What CT findings and Rx issues exist?
- What must be documented when treating stroke and ICH patients?
- How can ED patient Rx be optimized?

Edward P. Sloan, MD, MPH, FACEP



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

Edward P. Sloan, MD, MPH, FACEP



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

Edward P. Sloan, MD, MPH, FACEP

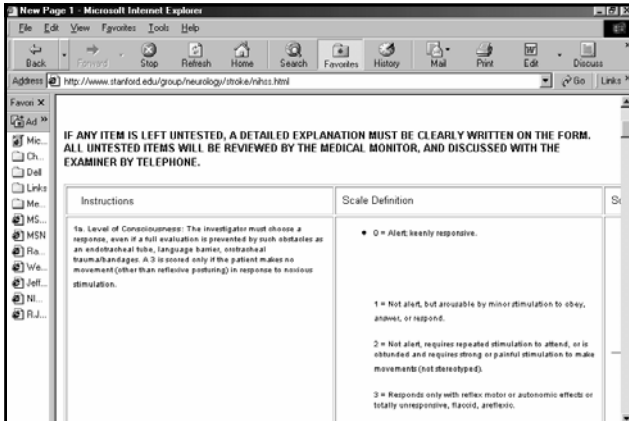


NIHSS Internet Calculator

- 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

Edward P. Sloan, MD, MPH, FACEP






NIHSS: LOC

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

- LOC: 7 points total




Edward P. Sloan, MD, MPH, FACEP

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




Edward P. Sloan, MD, MPH, FACEP

NIHSS: Motor

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

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




Edward P. Sloan, MD, MPH, FACEP

NIHSS: Cerebellar

- Limb ataxia 0-2 pts

- Cerebellar: 2 points total




Edward P. Sloan, MD, MPH, FACEP

NIHSS: Sensory

- Pain, noxious stimuli 0-2 pts

- Sensory: 2 points total



Edward P. Sloan, MD, MPH, FACEP

NIHSS: Language

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

- Language: 5 points total

19

Edward P. Sloan, MD, MPH, FACEP



NIHSS: Inattention

- Inattention 0-2 pts

- Inattention: 2 points total

20

Edward P. Sloan, MD, MPH, FACEP



NIHSS Composite

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

21

Edward P. Sloan, MD, MPH, FACEP



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

22

Edward P. Sloan, MD, MPH, FACEP



NIHSS ED Estimate

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

- Mild: 2, Moderate: 4, Severe: 8
- +/- Incorporates other elements

23

Edward P. Sloan, MD, MPH, FACEP



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

24

Edward P. Sloan, MD, MPH, FACEP



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



25

Edward P. Sloan, MD, MPH, FACEP

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



26

Edward P. Sloan, MD, MPH, FACEP

The Neurological Exam in ED Stroke and ICH Patients



27

Edward P. Sloan, MD, MPH, FACEP

Stroke Pt History

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



28

Edward P. Sloan, MD, MPH, FACEP

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



29

Edward P. Sloan, MD, MPH, FACEP

Stroke Physical Exam

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



30

Edward P. Sloan, MD, MPH, FACEP

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)

31

Edward P. Sloan, MD, MPH, FACEP



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

32

Edward P. Sloan, MD, MPH, FACEP



Sensory Exam

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

33

Edward P. Sloan, MD, MPH, FACEP



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

34

Edward P. Sloan, MD, MPH, FACEP



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

35

Edward P. Sloan, MD, MPH, FACEP



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

36

Edward P. Sloan, MD, MPH, FACEP



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

37

Edward P. Sloan, MD, MPH, FACEP



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**

38

Edward P. Sloan, MD, MPH, FACEP



Patient History

- 76 yo M with sudden onset paralysis, aphasia, no trauma, slumped over
- No history of similar symptoms in past
- Patient apparently was normal prior
- No known risk factors (DM, HTN)
- No Hx surgery, bleed that would preclude tPA use

39

Edward P. Sloan, MD, MPH, FACEP



Patient Physical Exam

- **Vital signs:** hypertension noted, pulse ox OK, POC glucose OK
- **HEENT:** Pupils midrange, reactive, no papilledema, airway OK
- **Neck:** No Bruits, no nuchal rigidity
- **Chest:** BSBE No Rales
- **Cardiac:** No afib, no gallops or murmurs

40

Edward P. Sloan, MD, MPH, FACEP



Patient Physical Exam

- **Abd:** No evidence of AAA, peritonitis
- **Ext:** No DVT or pedal edema evident
- **Skin:** No cellulitis or wounds
- **Neuro:** Please see below

41

Edward P. Sloan, MD, MPH, FACEP



Patient Neuro Exam

- **CN:** R mouth droop, no lid weakness
- **Motor:** R upper and lower ext weakness
- **Sensory:** ?? Light touch dec R
- **Reflex:** No pathological reflexes
Normal corneals
Normal gag reflex

42

Edward P. Sloan, MD, MPH, FACEP



Patient Neuro Exam

- Cerebellar: Slight truncal ataxia, to R
- Visual/Neglect: ?? Lost vision & neglect, R
- Language: Dysarthria, expressive aphasia
No receptive aphasia
- LOC: Slightly somnolent, responds to verbal stimuli, GCS=14
- Approximate NIHSS: 8

43

Edward P. Sloan, MD, MPH, FACEP



CT Documentation

- ICH: L parietal area 5 cm diameter
- No skull fracture evident
- No subdural or epidural
- No mass effect or midline shift
- No ventricular extension
- No hydrocephalus

44

Edward P. Sloan, MD, MPH, FACEP



ICH Patient Management

- Airway patent, urgent intubation NCI
- CT findings: parietal ICH, no SAH
- HTN noted. Labetalol Rx to MAP= 120
- No deterioration or acute ICP Rx
- Insulin, fosphenytoin given
- Pt stable, critical family aware
- Neurosurgery to evaluate pt, CT
- Surgical Rx prn

45

Edward P. Sloan, MD, MPH, FACEP



Diagnoses

- AMS, near syncope
- Intracerebral Hemorrhage
- Accelerated HTN
- Hyperglycemia, HX DM
- Critical care time 35 minutes

46

Edward P. Sloan, MD, MPH, FACEP



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?

47

Edward P. Sloan, MD, MPH, FACEP



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.

48

Edward P. Sloan, MD, MPH, FACEP



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

49

Edward P. Sloan, MD, MPH, FACEP



Key Learning Points

- Provide detailed ICH documentation
 - CT Findings
 - BP, ICH Rx
- Documentation: include tPA assessment
- Expedited ED care of the stroke patient must be provided, included VS and airway Rx, rapid CT performance & interpretation, and early neurological, NS consultation

50

Edward P. Sloan, MD, MPH, FACEP



Questions??

www.ferne.org
ferne@ferne.org

Edward P. Sloan, MD, MPH
edsloan@uic.edu
312 413 7490

ferne acep 2005 sloan_ich_neuroexam_cd.ppt 4/5/2005 6:14 PM

Edward P. Sloan, MD, MPH, FACEP

