



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

Edward P. Sloan, MD, MPH

Professor
Department of Emergency Medicine
University of Illinois at Chicago
Chicago, IL

Case Presentation

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 diabetes and hypertension.

On exam, BP224/124, 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.

How should the neurological exam be documented in the ED?

What is this patient's approximate NIH Stroke Scale (NIHSS) Score?

What are the next steps in the diagnosis and management of this patient?

Key Clinical Questions and Learning Points

How is the NIH Stroke Scale (NIHSS) calculated?

There are 11 parts to the NIHSS, with 13 specific tests being performed. The NIHSS examines for level of consciousness, vision and gaze, facial palsy and extremity weakness, limb ataxia, sensory loss, language and dysarthria, and neglect. It is designed to be conducted over 7 minutes. This scoring system can be printed up as a PDF file from the Internet at www.

What are the minimum and maximum scores possible on the NIHSS?

A patient with a completely normal neurological exam and normal mental status will have an NIHSS of 0. The maximum recordable NIHSS score is 42. However, since acute ischemic stroke causes unilateral paralysis and blindness, the maximum score actually is 31 for a stroke patient with complete hemiparesis, hemianopia, hemineglect, and aphasia.

What are some examples of NIHSS scores based on stroke physical findings?

A patient with only minimal facial or extremity weakness with some loss of sensation would have a NIHSS score of 1-2. A patient with a slight alteration in mental status, some loss of vision, slight facial droop, complete hemiparesis, sensory loss on the hemiparetic side, mild aphasia, and slight neglect will have an NIHSS of approximately 19. If these findings are noted as being severe, then the NIHSS would approach 31.

What NIHSS score is considered a severe stroke clinically?

Patients with an NIHSS score greater than 15-20 are considered to have a severe stroke clinically.

What was the average NIHSS seen in patients treated in the NINDS trials?

The median (50% above and below) NIHSS score was 14, consistent with a patient who has mild to moderate stroke physical findings.

Does the NIHSS score correlate with neurological outcome?

Yes. About 80% of patients with an NIHSS < 12- 14 will have a good or excellent outcome, whereas only 20% of patients with an NIHSS > 20-26 will have this similar good or excellent outcome.

Can the NIHSS be approximated clinically?

Yes. By addressing four major areas that are tested by the NIHSS, it is possible to estimate a patient's NIHSS score. These four areas are CN/visual, motor, level of consciousness, and language/neglect.

By assigning a grade to each area with regards to deficit (mild/moderate/severe), and a score of 2, 4, or 8, depending on the severity of the deficit, it is possible to estimate the NIHSS score. For example, if a patient has a severe deficit in all four areas, then the estimated NIHSS score would be 32. A mild deficit in all four areas would lead to an estimated NIHSS score of 8, and a moderate deficit in all four areas suggests an approximate NIHSS score of 16.

Can the NIHSS reliably be calculated retrospectively from the ED record?

Yes. Studies have demonstrated that the NIHSS (and other scoring systems) can be calculated retrospectively if there is adequate documentation of the neurological exam. This suggests the need to document this exam in a systematic and complete fashion in the ED medical record.

What are the parts of the neurological exam that should be documented in the ED medical record?

The recorded ED neurological exam should include the following parts: CN, motor, sensory, cerebellar, reflex, visual/neglect, language, and level of consciousness. The overall physical exam should also attempt to detect pathologies that would suggest the etiology of the stroke, such as atrial fibrillation suggesting an embolic stroke, and the presence of a carotid bruit or AAA suggesting diffuse vasculopathy and a possible setting for a thrombotic stroke.

How can the ED neurological exam be made more efficient?

By simply asking questions regarding the neurological exam and documenting what is observed in each of the parts of the neurological exam, it can be made more efficient. For example, for the CN exam, ask the question: Is there a mouth droop or eye closure weakness? In the ED chart, simply record: “R mouth droop noted, no eye closure weakness.” This may be more accurate and efficient than stating “CN II-XII intact”. For the language exam, ask: Can the patient use his mouth muscles? Can he understand the spoken word? Does he struggle to generate the language he wishes to use? In the ED chart, record “The patient appears able to use his mouth and understands language, but cannot find the words to express his thoughts, consistent with an expressive aphasia.” For the sensory exam, instead of stating “sensory intact”, it might better be stated “light touch examined, no focal abnormalities.”

What must be documented in the ED record when considering tPA use?

Who was spoken to and whether they understood what was stated?

The key clinical concepts from the NINDS clinical trial: With tPA,

- There is a 30% > chance of a good outcome at 3 months.
- There is 10x > 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?

For example:

- 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 patient status, agreed with expedited tPA use, to follow.

What must be documented regarding the CT evaluation of patients with stroke and suspected intracerebral hemorrhage?

It documenting the CT exam in patients with stroke and suspected ICH, the following should be noted:

- Presence or absence of trauma or fracture.
- Presence or absence of a subdural or epidural.
- Presence of subarachnoid blood
- Location of intracerebral hemorrhage, approximate size, and whether it extends into the ventricles
- Presence of local mass effect or midline shift
- Presence of acute hydrocephalus as a result of outflow obstruction

What treatment issues should be documented in the medical record of patients with intracerebral hemorrhage?

When documenting the treatment of ICH patients, it is important to document the following:

- Complete neurological exam, including mental status, NIHSS and GCS
- Airway competency
- CT findings
- Blood pressure management, based on hypertensive urgency or emergency, as well as target BP (MAP = 120, for example)
- ICP management, including rationale for presumed elevated ICP and why specific therapies were chosen, in consultation with whom
- Glucose and seizure management
- Results of therapies, and pt stability and neuro status over time

Patient Case Outcome

The following is an example of how the ED medical record can be documented as a stroke patient is examined and treated.

ED History & Physical Document

- 76 yo M with sudden onset paralysis, R sided weakness, aphasia, decreased LOC at kitchen table
- No history of similar symptoms or CVA in past
- Patient apparently was normal prior
- Pt with hx DM (oral meds) and HTN
- No chest pain SOB, or recent illness. No trauma or syncope history
- Daily ASA use, no anticoagulants

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

- CN: R mouth droop, no lid weakness
- Motor: R upper and lower ext weakness, mild
- Sensory: ?? Diminished light touch of R extremities
- Reflex: No pathological reflexes
Normal corneals, normal gag reflex
Snoring with no stimulation
- Cerebellar: Slight truncal ataxia, to R, when sitting up in cart
- Visual/Neglect: ?? Mild neglect of R
- Language: Dysarthria, expressive aphasia, no clear receptive aphasia
- LOC: Slightly somnolent, responds to verbal stimuli, GCS=14
- Approximate NIHSS: 8

ED Management and Patient Outcome

- CT: intracerebral hemorrhage L
 - Parietal, largest diameter 5 cm
 - No ventricular extension
 - No mass effect or midline shift
- NIH stroke scale: approx 8
- EKG NSR with LVH
- CXR No evidence aspiration
- Labs OK, two hour rule out cardiacs negative
- PMD, family aware
- NTN treated with labetalol,, adequate control with MAP approx 120
- No deterioration or evidence of increased ICP requiring Rx
- Fosphenytoin given, to follow glucose, insulin prn
- Pt stable to ICU, family aware of diagnosis and need for close observation
- Neurosurgeon aware, defers OR at this time, will follow. Can place ICP monitor or take to OR prn if patient status deteriorates.
- Plan to recheck CT in 12 hours

Diagnoses: **AMS, near syncope**
 Intracerebral hemorrhage
 Accelerated HTN
 Hyperglycemia, Hx DM

Critical care time: **35 minutes**