



Speaking the Same Language: Emergency Department Evaluation of Stroke Patients

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Case Presentation

A 36 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. On initial ED exam, the patient was slightly somnolent. 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.

The first year EM resident reaches for the phone to call a neurologist and realizes he needs to have a clear and succinct method of conveying the presentation of this stroke patient to his consultant.

How does the NIH Stroke Scale (NIHSS) score influence the care of stroke patients?

What do EM physicians need to know about the Modified Rankin Scale and the Barthel Index?

How will the understanding of stroke scales impact the practice of emergency medicine in the future?

Key Clinical Questions and Learning Points

What stroke scales are relevant to the EM physician in the treatment of this patient?

There are three major stroke scales that EM physicians should be aware of; NIH Stroke Scale, Modified Rankin Scale, Barthel Index. The NIHSS is used in the acute assessment of stroke patients and to measure changes in the neurological status of patients as their stroke evolves. The Modified Rankin and Barthel Index are outcome measures used in the assessment of stroke patients when disposition and level of assistance are being determined.

How does the NIH Stroke Scale (NIHSS) Score influence the care of stroke patients?

The NIHSS is used to assess the level of neurological deficit that stroke patients have at the time of presentation. 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. 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. These scores are relevant when assessing whether or not therapeutic intervention is warranted in a particular patient. As a reference point the average NIHSS of patients enrolled in the NINDS trial assessing the use of thrombolytics was 14. 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. Patients with an NIHSS score greater than 15-20 are considered to have a severe stroke clinically. Clinical outcomes can be predicted based on the NIHSS. 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.

What do EM physicians need to know about the Modified Rankin Scale?

The Modified Rankin Scale was designed for use in stroke patients and is a six-point scale (0 through 5) that measures the ability to conduct activities of daily living, such as walking, eating, and dressing. It also takes into account the patients ability to manage personal affairs such as shopping and processing a checkbook. A score of 0 is completely independent and a score of 5 is bedridden and in need of constant care. This scale is measured first after the patient is stable during the inpatient stay and then repeated as the ability of the patient to care for him/herself changes. Emergency physicians will not be calculating the Modified Rankin Scale in the ED. However, emergency physicians need to be aware of this scale because it appears frequently in the literature regarding stroke outcomes in clinical trials. Authors consider a positive outcome to be patients with Modified Rankin Scores of 0 to 1 or 2. Negative outcome scores are therefore 3 to 5 with 6 occasionally being used for death. The difference between using 0/1 as “recovered” verses 0/1/2 can be significant. The Modified Rankin Scale has been used in most of the major recent trials on stroke therapy. In the NINDS thrombolysis in stroke trial the Modified Rankin Scale was used as one of 4 outcome measures assessed at 90 days. Comparing the placebo group to the thrombolysis group there was a 13 percent absolute increase in the number of patients with minimal or no disability (Modified Rankin scores of 0 or 1) in the thrombolysis group. Thus nine patients need to be treated with thrombolytics to see one return to minimal or no disability. Just recently, the Modified Rankin Scale was used as the primary outcome in the SAINT I trial for the new neuroprotectant, NXY-059. There was a 4.4% absolute increase in the number of patients with a Modified Rankin Score of 0 in the treatment group. This corresponds with needing to treat 22 stroke patients with NXY-059 to return one to completely normal function. Understanding how this scale is used in clinical trials allows the conclusions of those trials to be better assessed.

What do EM physicians need to know about the Barthel Index?

The Barthel Index is a measurement of physical disability. The Barthel Index specifically measures 10 activities of daily living, such as feeding, bathing, grooming, dressing, toilet use (bowel and bladder), and bed to chair transfer, mobility and stairs use. The Barthel index is measured on a 100 point scale with the higher the score indicating more independence. A score of 100 is complete independence, and a score of 0 is bedridden. Like the Modified Rankin Scale, the Barthel Index is used in two primary ways, as an outcome measurement in clinical

trials stroke research and as an assessment tool during inpatient hospitalization and in the rehabilitation setting. Emergency physicians will not be calculating a Barthel Index score on acute stroke patients in the emergency department. Comparing the Modified Rankin Scale with the Barthel Index it is important to note the Modified Rankin Scale does a better job of assessing higher level functioning while the Barthel Index measures strict physical functioning. Therefore, it is possible for a patient to score a 100 on the Barthel Index and score a 2 on the Modified Rankin Scale because he is unable to do activities he used to do such as driving a car or playing golf. Emergency physicians need to be aware of the Barthel Index because of its use as an outcome measure in many of the recent stroke clinical trials. The Barthel Index was used as one of the four primary outcome measures at 90 days in the NINDS thrombolysis in acute ischemic stroke trial. Comparing the placebo group to the thrombolysis group there was a 12 percent absolute increase in the number of patients with minimal or no disability (Barthel Index scores of 95 to 100) in the thrombolysis group.

How will the understanding of stroke scales impact the practice of emergency medicine in the future?

As other therapies for stroke become available it will be important for emergency physicians to be able to assess patients in a consistent manner that will allow them to speak with consultants in a mutually understandable way. The NIHSS is one way of achieving this goal. One concern of EM physicians is that the NIHSS is cumbersome and takes too long to assess. However, the NIHSS may be able to be estimated in the following way. 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. In addition, understanding how stroke scales are used in outcome measures will assist EM physicians in their critical evaluation of the new therapeutic modalities presented in the medical literature.