Improving the Clinical Diagnosis of Stroke

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See related articles, pages 769–775, 776–780.

Clinicians recognize that the history and physical examination form the basis of diagnosis and are critical for determining a treatment plan for patients with suspected stroke. This central role of the history and examination are reflected in the ASA/AHA Stroke Council’s Guidelines for the Early Management of Patients With Ischemic Stroke. Quality literature on this important topic is surprisingly limited. After eliminating review articles and case series, a MEDLINE search conducted as part of a systematic review of English language articles (1994–2005) yielded only 4 potentially relevant studies. Two related reports now add to our knowledge of this important subject.

Prior work shows that symptoms associated with high interobserver agreement for the diagnosis of stroke or TIA versus no vascular event are a sudden change in speech, visual loss, diplopia, numbness or tingling, paralysis or weakness and nonorthostatic dizziness (κ = 0.60, 95% CI: 0.52 to 0.68). The reliabilities of individual neurological findings vary from slight to almost perfect but can be improved with the use of standardized scoring systems.

The first of the 2 new reports focuses on interobserver agreement (ie, reliability) for the bedside clinical assessment of patients with suspected stroke. There are 2 important caveats to bear in mind when considering the results. Historic information was obtained only from the patients themselves, many of whom were confused. In the usual clinical setting, historic information is gleaned from the patient, family members, as well as other observers including emergency medical personnel. It is the combination of information from these sources that is used to aid diagnosis and clinical decisions. Second, only 15 patients (15%) were assessed within 12 hours of onset. It is conceivable that the reliability of historic information, including time of onset data, might be either more or less reliable than reported in this study when obtained from several sources in a hyperacute population. Consistent with previous studies, Hand et al also found that interobserver reliability for most items of the history can be assessed with moderate-to-good reliability (eg, point estimates of the κ statistic for vascular risk factors ranged from 0.44 to 0.69).

Interobserver agreement for various features of the neurological examination ranged from poor (eg, neglect syndromes, κ = 0.34, 95% CI: 0.16 to 0.51) to perfect (eg, unconsciousness, κ = 1.00, 95% CI: 1.00 to 1.00). The diagnosis of stroke was made with moderate-to-good agreement (κ = 0.77, 95% CI: 0.60 to 0.93).

Determining the time of symptom onset is particularly important for decisions regarding the use of reperfusion therapy, but agreement was only moderate (for the item, “exact time of onset can be determined,” κ = 0.63, 95% CI: 0.47 to 0.78; for “patient awoke with deficit,” κ = 0.44, 95% CI: 0.40 to 0.69). The problem of determining the time of symptom onset based on historic information is underscored by data being collected as part of ongoing stroke registry efforts (eg, time of symptom onset could be obtained for only 65% of stroke patients enrolled during the first year of the North Carolina Cooperative Stroke Registry), and further emphasizes the need to develop objective, tissue-based methods for assessing the potential reversibility of ischemic brain injury.

One of the key goals of the emergent clinical assessment is to arrive at a probable diagnosis. The second report by Hand et al is derived from data collected as part of the same study and deals with distinguishing between stroke and stroke mimics based on history and examination findings. The prior probability of a stroke among unscreened patients with neurologically relevant symptoms transported to an emergency department is ≈10%. Prior work based on studies using modern neuroimaging finds that the presence of acute facial paresis, arm drift and/or abnormal speech increases the likelihood of stroke (likelihood ratio, LR = 1 finding = 5.5; 95% CI: 3.3 to 9.1), whereas the absence of all 3 decreases the odds (LR = 0.39; 95% CI: 0.25 to 0.61). Hand et al found that 31% of patients evaluated with possible stroke actually had a stroke mimic. Features that particularly increased the odds of stroke included a definite history of focal neurological symptoms (odds ratio, OR = 7.21, 95% CI: 2.48 to 20.93) and being able to determine the exact time of the onset of symptoms (OR = 2.59, 95% CI: 1.30 to 5.15). This is consistent with the common clinical criteria for a cerebrovascular event (ie, abrupt onset of focal neurological symptoms or signs of a presumed vascular etiology). The logistic regression model developed from these data resulted in 83% correct classifications. The caveats reviewed in reference to the first report and discussed by the authors are also relevant to this study. In addition, in practice, the diagnosis of stroke depends on a constellation of symptoms and signs. No one symptom or sign can rule in or rule out the diagnosis. As always with studies of this type, the logistic model should be viewed as descriptive of the dataset from which it was derived and needs to be validated with external data.
Stroke mimics identified in this study (Table 2) are similar to those found in previous reports. Many can be diagnosed with simple laboratory tests (eg, blood glucose), and modern hospitals caring for stroke patients intending to use reperfusion therapy need to have immediate neuroimaging available, both to support the clinical diagnosis of stroke and to exclude hemorrhage. One purpose of improving the rapid, accurate clinical diagnosis of stroke is to reduce delays in obtaining the necessary neuroimaging study. Although intended for use in the prehospital setting, several validated systems are available for this purpose.7,9,10 and could be evaluated to determine whether their use in the emergency department would lead to the more rapid institution of appropriate treatment.

In the first report, Hand et al found that reliability improved with the experience and confidence of the examiner.8 In the second report, they stress that, “As stroke is a clinical diagnosis, these data reinforce the need for neurologists or stroke physicians with adequate neurological training to be involved in the assessment of patients with brain attack.”9 Although the care of stroke patients by neurologists has been associated with improved outcomes,11,12 many stroke patients are never seen by a neurological specialist.11 In 1997, the American Academy of Neurology found that nearly 20% of medical schools in the United States did not have required clinical training in neurology.13 A survey of 40 academic medical centers in the United States revealed 40% of programs did not have dedicated stroke instruction during medical-student clinical rotations with only 35% offering stroke education for trainees in internal medicine.14 Incorporation of stroke prevention into the medical school curriculum is associated with long-term increases in students’ stroke-related knowledge, awareness and interest.15 Given the frequency and importance of stroke, the data from Hand et al suggest that a lack of appropriate clinical instruction may have a negative impact on the timely, accurate diagnosis of stroke. Inclusion of adequate neurological training with a particular emphasis on stroke in medical school curricula may lead to both improved clinical diagnosis and outcomes of stroke patients.

**Key Words:** diagnosis ▪ physical examination ▪ stroke

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**References**


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