

Evidence-Based Diagnosis of Nontraumatic Headache in the Emergency Department: A Consensus Statement on Four Clinical Scenarios

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Nontraumatic Headache in the Emergency Department

Objective.—To provide to emergency department (ED) physicians with guidelines for diagnosis of patients with nontraumatic headaches.

Background.—Many patients present to an ED with the chief complaint of headache. Causes of nontraumatic headache include life-threatening illnesses, and distinguishing patients with such ominous headaches from those with a primary headache disorder can be challenging for the ED physician.

Conclusion.—We present a consensus statement aimed to be a useful tool for ED doctors in making evidence-based diagnostic decisions in the management of adult patients with nontraumatic headache.

Methods.—A multidisciplinary work performed an extensive review of the medical literature and applied the information obtained to commonly encountered scenarios in the ED.

Key words: spinal puncture, diagnosis, guidelines, computed tomography, electroencephalography, subarachnoid hemorrhage, temporal arteritis, cerebrospinal fluid, emergencies

Abbreviations: ED emergency department, NTH nontraumatic headache, SAH subarachnoid hemorrhage, CT computed tomography, LP lumbar puncture, MRI magnetic resonance imaging, pts patients, TA temporal arteritis

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Headache is one of the most common symptoms and a major reason for medical consultation. Of all patients accessing emergency departments (EDs) 1.7% to 4.5% report nontraumatic headache (NTH) as their primary medical problem.¹⁻³ The first step in evaluating such patients involves exclusion of secondary headaches that reflect an underlying life-threatening conditions (eg, subarachnoid hemorrhage).⁴ Given the wide variability of presenting signs and symptoms, differential diagnosis between primary and secondary NTH can be challenging for ED doctors, and uncertainty in some cases may lead to unnecessary hospital admission.¹⁻⁴

The teaching hospital in Modena (a town with 176,000 inhabitants in the Emilia Romagna region, northern Italy), receives 21,000 ED patient visits

each year. Of 9724 patients evaluated in the period from January to June 2001, 335 patients (3.5%) complained of NTH as their primary medical problem. Of those patients 123 (37%) were admitted, and 52 (50%) were subsequently discharged with a diagnosis of migraine, tension-type headache, or unspecified headache. Those patients with a final diagnosis of primary headache typically manageable in an outpatient setting are defined as “inappropriate admissions” by the Admission Criteria of the Regional Health Authority, which promotes initiatives to improve the quality of health care.

These findings led to the constitution of a multi-professional work group to produce a consensus statement on the diagnosis and treatment of NTH in the ED.

METHODS

In December 2000, a multidisciplinary work group of selected health professionals from the two Local Health Authorities of Modena was convened with the aim of providing ED physicians in Emilia Romagna useful and simple guidelines for the diagnostic and therapeutic management of adult patients present-

ing with a chief complaint of NTH (Figure 1). Emilia Romagna is a region with four million inhabitants in northern Italy where the town of Modena is located. The work group included 14 neurologists, 2 radiologists, 7 ED doctors, 3 clinical epidemiologists, 1 neurosurgeon, 1 expert in infectious disease, and 2 health care administrators.

Critical issues in the differential diagnosis between primary and secondary headache were addressed by formulating four “clinical scenarios” of patients with NTH that corresponded to common situations encountered in clinical practice:

1. severe headache with acute onset (thunderclap headache), or with neurological signs, or with vomiting, or syncope at the onset of headache;
2. severe headache with hyperpyrexia and/or neck stiffness;
3. headache of recent onset (days or weeks), or progressive worsening headache, or persistent headache;
4. recurrent headache (past history of headache with similar features).

Information relevant to these scenarios was sought by an extensive review of the literature,

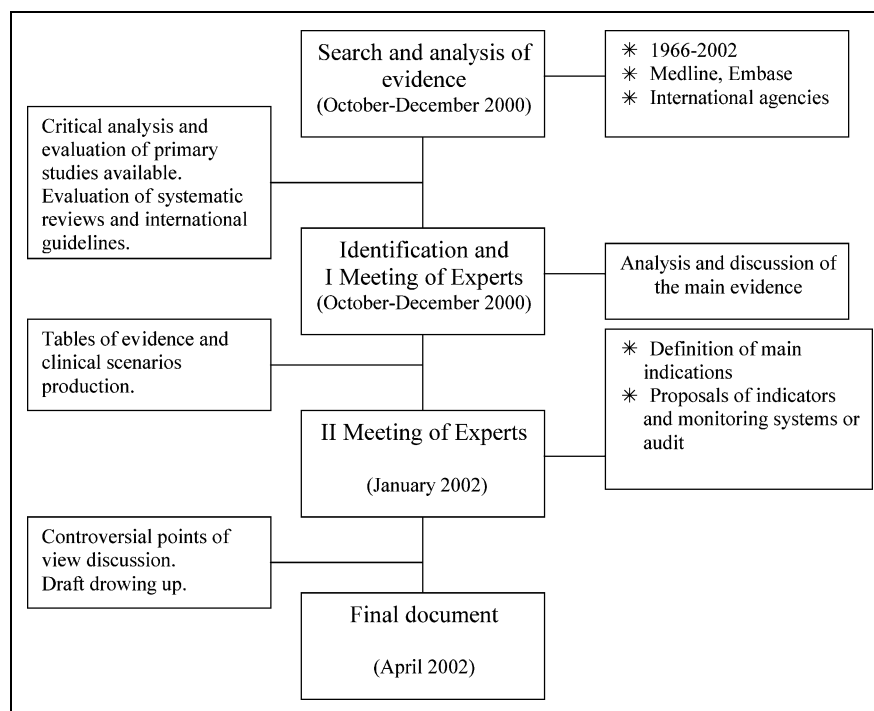


Fig 1.—Stages of the study.

Table 1.—Databases and Guidelines Consulted

Databases	URL
American Academy of Neurology	http://www.aan.com/
ANAES (Agence Nationale d'Accréditation et d'Evaluation en Santé)	http://www.anaes.fr/ANAES/Framedef.nsf/ANAES?ReadForm
Canadian Medical Association Infobase	http://www.cma.ca/cpgs/
Canadian Task Force on Preventive Health Care	http://www.ctfphc.org/
National Guideline Clearinghouse	http://www.guideline.gov/index.asp
New Zealand Guidelines Group	http://www.nzgg.org.nz/LIBRARY.CFM
Prodigy Guidance	http://www.prodigy.nhs.uk/guidance/list.htm
SIGN (Scottish Intercollegiate Guideline Network)	http://www.sign.ac.uk/guidelines/index.html

performed via MEDLINE (years 1966 to 2002), the Cochrane Library Database of Systematic Reviews, Best Evidence 5, and electronic practice guidelines databases (Table 1). Additional articles from the bibliography cited and from standard and electronic texts (Neurobase) were reviewed.⁵ The four scenarios and the relevant guidelines were formulated through an informal consensus process developed during three conferences.

RESULTS (CLINICAL SCENARIOS AND STATEMENTS)

Our search yielded nine sets of guidelines and 42 articles.⁶⁻¹⁴ We found no guidelines focusing on the diagnostic management of NTH in the ED, and recommendations on this topic were extrapolated from guidelines on the diagnostic and therapeutic management of headache or migraine in general practice.^{1-4,15-51,53} For each of the four clinical scenarios, guidelines for clinical practice were devised (Figure 2).

Each scenario is structured into four parts:

1. "Patients": describing the signs and symptoms defining a "typical" clinical situation in which a certain condition should be suspected.
2. "Statement": recommending the most appropriate diagnostic procedures to be performed in that situation, according to the results of the literature reviewed.
3. "The evidence": summarizing the results and conclusions of the studies from which a consensus was reached.

4. The references of the studies are summarized in the evidence section.

Each guideline is clearly linked to the evidence it comes from, making statements explicit and evidence-based.

Scenario 1.—Patients.—Adult patients were admitted to an ED for severe headache ("worst ever headache"), with acute onset headache ("thunderclap headache"), or with focal (eg, hemiparesis) or nonfocal (eg, decreased consciousness) neurological findings, or with vomiting or syncope at the onset of headache.

Statement.—Head computed tomography (CT) must be performed. If the result of the CT scan is negative, or uncertain, or of poor quality, lumbar puncture (LP) is indicated. If LP shows no abnormality, the patient should be evaluated by a neurologist, or by a physician with expertise in headache, within 24 hours.

The Evidence.—When confronted with a patient who has experienced thunderclap headache, the physician's primary concern should be the exclusion of aneurysmal SAH. Less than 1% of all patients accessing an ED have subarachnoid hemorrhage (SAH).¹ Because of its potentially lethal or seriously disabling outcome, early recognition of SAH is critical. The typical symptom of SAH is severe headache of sudden onset, frequently described as being the worst headache of one's life, although other clinical presentations are possible.^{8,11} Symptoms and signs associated with SAH are headache (20% to 74%), nausea or vomiting (77%), and syncope (53%). Neurological signs, including impaired consciousness, occur in 64% of cases.¹⁵⁻¹⁸ Neck stiffness is reported in 35% of

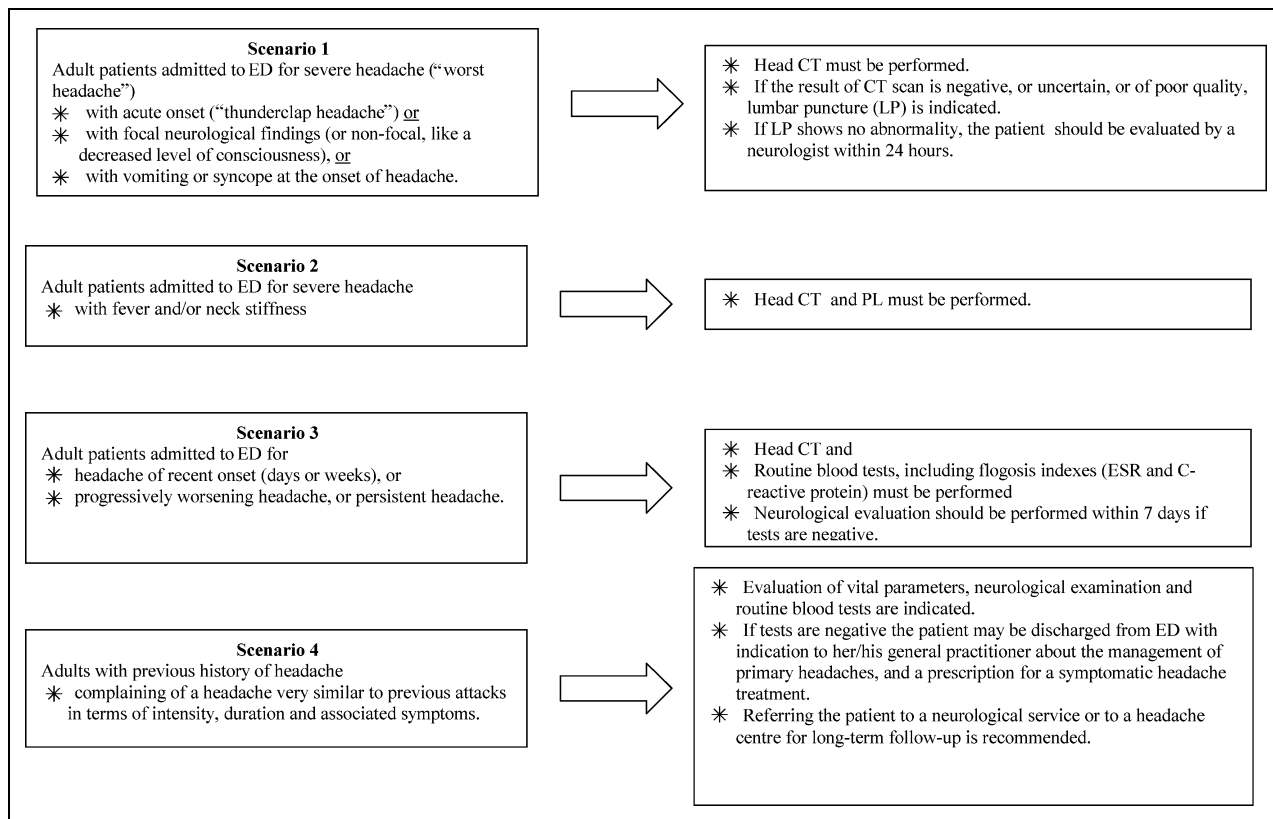


Fig 2.—Emergency Department’s assessment of nontraumatic headache.

patients with SAH documented by CT, LP, cerebral angiography, surgery, or autopsy.¹⁵ Abnormal findings on neurological examination are the best clinical predictors of structural intracranial pathology with a positive predictive value of 39%.² The differential diagnosis of thunderclap headache, is summarized in Table 2.¹⁶⁻²² Thunderclap headache may be associated with an unruptured aneurysm, which can be detected by MRI or angiography.¹⁸

When headache is associated with neurological signs and/or papilledema, tumors, vascular malformations, stroke, vasculitis, pseudotumor cerebri, and meningitis also must be considered.^{3,5,23,24}

Many authors agree that head CT is the first choice examination when SAH is suspected. Thin cut slices (5 mm) through the posterior fossa of the brain are recommended, since with thicker cuts (10 mm) small collections of blood may be missed.^{6,14,16,25,26} Head CT performed within 24 hours after the onset of SAH is abnormal in 95% of patients, but only in 50% after 1 week.^{27,28} Three or four days after the bleeding,

gradient-echo magnetic resonance imaging is more sensitive than CT in the detection of SAH.²⁹ When SAH is strongly suspected on clinical grounds but the CT is negative, LP is indicated.^{6,8} Even so, because

Table 2.—Differential Diagnosis of “Thunderclap Headache”

Aneurysmal SAH
Nonaneurysmal SAH
Expansion or thrombosis of unruptured intracranial aneurysm
Intracerebral hemorrhage
Acute ischemic stroke
Subdural and epidural hematomas (rare)
Internal carotid and vertebral artery dissection
Cerebral venous thrombosis
Pituitary apoplexy
Colloid cyst of the third ventricle
Acute expansion of a mass lesion in the posterior fossa
Spontaneous intracranial hypotension
Benign sexual headache (“explosive” type)
Benign exertional headache
Cough and exertional headaches
Acute sinusitis (particularly with barotrauma)
Benign thunderclap headaches

of the variability of the time for oxyhemoglobin release, a normal LP with 12 hours of the ictus does not exclude SAH.⁵ If the neurological examination is normal and the patient with suspected SAH is fully alert, LP often is performed without CT, but the safety of this procedure has not yet been investigated prospectively.^{6,16,30-32} Finally, the differential diagnosis of sudden headache also includes carbon monoxide poisoning.³³

Scenario 2.—Patients.—Adult patients were admitted to an ED for severe headache with fever and/or neck stiffness.

Statement.—Both CT and LP should be performed.

The Evidence.—When a patient is admitted to an ED with acute headache as a prominent symptom, general malaise, fever and/or neck stiffness, meningitis, encephalitis, connectivitis, and systemic infections have to be considered in the differential diagnosis.^{3,24,34-37} The safety of LP without previous CT has not been investigated prospectively, but it seems reasonable that in the absence of focal neurologic findings or evidence of increased intracranial pressure, LP may be performed without obtaining a neuroimaging study.^{6,16,30-32} In bacterial meningitis, early diagnosis and prompt treatment can improve outcome; indeed, in patients with suspected meningitis early administration of broad-spectrum antibiotics (eg, ceftriaxone) is recommended even before the completion of laboratory tests.^{35,38,39} A new onset of headache in immunocompromised patients may be associated with meningitis (aseptic, chronic inflammatory, or carcinomatous), brain abscess, metastasis, toxoplasmosis, or other opportunistic infections.^{8,14,34}

Scenario 3.—Patients.—Adult patients presenting to an ED for headache of recent onset (days or weeks), progressively worsening headache, or persistent headache (weeks or months).

Statement.—CT and routine blood tests, including inflammatory indexes such as erythrocyte sedimentation rate and C-reactive protein, should be performed. Neurological evaluation should be performed within 7 days if tests are negative.

The Evidence.—Headache is not uncommon in the elderly; in patients older than 50 years presenting with progressively worsening headache, a diagnosis of temporal arteritis (TA) or intracranial neoplasm

must be entertained.^{14,40-47} Intracranial mass lesions can include colloid cyst of the third ventricle that, although rare, may cause sudden death.^{48,49} Temporal arteritis, an inflammatory vasculopathy, typically affects elderly patients, with a prevalence of 133 per 100,000 in the population aged 50 years or older.⁴¹ Signs and symptoms strongly suggestive of TA in a patient with headache of recent onset include: jaw claudication (strongly related to positive biopsy) and abnormal temporal arteries (decreased pulse, thickening, swelling, and/or tenderness). Recent onset headache with jaw claudication and arterial abnormalities have a sensitivity of 34%, a specificity >99%, and a positive likelihood ratio of 47 for a diagnosis of TA.^{44,50} An elevated erythrocyte sedimentation rate (>30) has a high sensitivity (99%) but a low specificity (50% to 70%).^{43,50-53}

Scenario 4.—Patients.—Adult patients with a history of headache who complained of headache very similar to previous attacks in terms of intensity, duration, and associated symptoms.

Statement.—Evaluation of vital parameters, neurological examination, and routine blood tests are indicated. If tests are negative, the patient may be discharged from ED with a referral to her/his primary care provider for further management of the presumed primary headache disorder, and a prescription for a symptomatic headache treatment. Referral of the patient to a neurologist or to a headache center is also a reasonable option.

The Evidence.—Most patients with a primary headache disorder characterized by recurrent attacks come to the ED after failure of their usual symptomatic therapy.^{4,8} In adult patients with recurrent headache already diagnosed as migraine (with or without aura) and with no recent change in headache pattern, no seizure activity, and without new focal neurological signs and symptoms, the routine use of neuroimaging is not warranted.^{7,14} After excluding causes for concern, via an adequate history and physical examination, this type of headache can be considered a primary headache with a high probability of readmission in the ED.⁸ These patients should be referred to general practitioners or to a specialized center for long-term follow-up so as to minimize repeated utilization of the ED, to secure precise diagnosis of headache

based on International Headache Society criteria, and to implement and monitor proper long-term treatment.^{3,4,10,13,54}

COMMENTS

Most patients with headache who access an ED are experiencing an acute exacerbation of a fundamentally benign primary headache disorder and do not require hospital admission.¹⁻⁴ Even so, all such patients should be evaluated carefully to avoid overlooking ominous but potentially treatable conditions such as SAH.

In this article we present a simple instrument for the diagnostic management of NTH in ED, emphasizing historical and objective variables that could indicate a life-threatening cause of headache. To our knowledge, no management criteria similar to ours have been published to date. Our instrument's utility in practice needs formal validation, but, being structured on common clinical scenarios rather than specific types of headache, it should be sufficient to define general principles useful for improving the clinical effectiveness and efficacy in the busy setting of the ED. Accordingly, we hope that implementation of these suggestions could serve to reduce the variability in management exhibited by clinicians who evaluate in the ED and, specifically, optimize the use of limited resources such as neuroimaging and maximize the predictive value of head CT and LP.^{14,18,25,26,29,30}

Our study has some limitations. First, the literature search for the evidence on which to base our statements included only published studies. No pre-defined criteria for including and formally evaluating retrieved studies were adopted, so our review cannot be defined as strictly "systematic."⁵⁵ In defense, however, our search was performed not only on electronic databases of primary studies, but also on databases of guidelines produced by international panels or developed from systematic reviews, and these served as references for local implementation of clinical practice recommendations. None of the guidelines we found focused only on the specific problem of NTH diagnosis in the ED, but the direction of the evidence and the strength of recommendations in the guidelines were all similar. This suggests that there is an overall consensus on these topics, although the available supporting evidence is not strong. As the term im-

plies systematic formulation of developed recommendations, we decided not to define our instrument as a "guideline."⁵⁶ Second, in some cases of NTH caused by uncommon conditions, our instrument might be too insensitive to allow a correct diagnosis. Our objective was to provide an easy-to-use instrument for ED physicians, who sometimes have to make quick decisions pertinent to the often troublesome diagnostic process involved in headache. Our suggestions represent a compromise between accuracy and clinical pragmatism. In our opinion, only patients in scenarios 1 and 2 require admission, whereas those in scenario 3 with negative tests, and those falling into scenario 4 could be followed in an outpatient setting (excluding those with uncontrolled cluster headache, chronic migraine/analgesic overuse, and status migrainous, for whom admission may be necessary for appropriate treatment).

Other, more precise diagnostic tools, based on the identification of "red flags," have been used in our hospital, but their applicability in a busy ED was poor and when applied did not reduce admissions.^{57,58}

The literature regarding management of NTH in the ED is limited. Hopefully our contribution will stimulate others to undertake further investigation in this area. Our own work group intends to undertake studies to validate the clinical applicability and utility of the instrument described here.

APPENDIX

Study Design

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