

Evaluation of Acute Headaches in Adults

C. RANDALL CLINCH, D.O., Uniformed Services University of the Health Sciences, F. Edward Hébert School of Medicine, Bethesda, Maryland

Classifying headaches as primary (migraine, tension-type or cluster) or secondary can facilitate evaluation and management. A detailed headache history helps to distinguish among the primary headache disorders. "Red flags" for secondary disorders include sudden onset of headache, onset of headache after 50 years of age, increased frequency or severity of headache, new onset of headache with an underlying medical condition, headache with concomitant systemic illness, focal neurologic signs or symptoms, papilledema and headache subsequent to head trauma. A thorough neurologic examination should be performed, with abnormal findings warranting neuroimaging to rule out intracranial pathology. The preferred imaging modality to rule out hemorrhage is noncontrast computed tomographic (CT) scanning followed by lumbar puncture if the CT scan is normal. Magnetic resonance imaging (MRI) is more expensive than CT scanning and less widely available; however, MRI reveals more detail and is necessary for imaging the posterior fossa. Cerebrospinal fluid (CSF) analysis can help to confirm or rule out hemorrhage, infection, tumor and disorders related to CSF hypertension or hypotension. Referral is appropriate for patients with headaches that are difficult to diagnose, or that worsen or fail to respond to management. (*Am Fam Physician* 2001;63:685-92.)



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Headache, or cephalalgia, is defined as diffuse pain in various parts of the head, with the pain not confined to the area of distribution of a nerve. Headache is among the most common pain problems encountered in family practice. One epidemiologic study¹ found that 95 percent of young women and 91 percent of young men experienced headache during a 12-month period; 18 percent of these women and 15 percent of these men consulted a physician because of their headache.

The direct and indirect costs of migraine have been estimated at approximately \$17 billion per year. Missed workdays and medical benefits associated with headache cost American industry approximately \$50 billion annually.²

In 1988, the International Headache Society published a classification system for headache disorders.³ This extensive system is not convenient to apply in the clinical setting. However, it is diagnostically and therapeutically useful to consider headaches as being divided into two categories: primary and secondary. Pri-

mary headaches, which include migraine, tension-type headache and cluster headache, are benign; these headaches are usually recurrent and have no organic disease as their cause⁴ (*Table 1*).³ Secondary headaches are caused by under-

TABLE 1
Acute Primary Headache Disorders

More common

Migraine with or without aura
Tension-type headache
Cluster headache

Less common

Paroxysmal hemicrania
Idiopathic stabbing headache
Cold-stimulus headache
Benign cough headache
Benign exertional headache
Headache associated with sexual activity

Adapted with permission from Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. Headache Classification Committee of the International Headache Society. Cephalalgia 1988;8(suppl 7):1-96.

TABLE 2

Acute Secondary Headache Disorders

Headache associated with head trauma	Headache associated with noncephalic infection
Acute post-traumatic headache	Viral infection
Headache associated with vascular disorders	Bacterial infection
Subarachnoid hemorrhage	Headache associated with metabolic disorder
Acute ischemic cerebrovascular disorder	Hypoxia
Unruptured vascular malformation	Hypercapnia
Arteritis (e.g., temporal arteritis)	Mixed hypoxia and hypercapnia
Carotid or vertebral artery pain	Hypoglycemia
Venous thrombosis	Dialysis
Arterial hypertension	Other metabolic abnormality
Headache associated with nonvascular intracranial disorder	Headache or facial pain associated with disorder of cranium, neck, eyes, ears, nose, sinuses, teeth, mouth or other facial or cranial structures
Benign intracranial hypertension (pseudotumor cerebri)	
Intracranial infection	
Low cerebrospinal fluid pressure (e.g., headache subsequent to lumbar puncture)	Cranial neuralgias, nerve trunk pain and deafferentation pain
Headache associated with substance use or withdrawal	
Acute use or exposure	
Chronic use or exposure	

Adapted with permission from Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. Headache Classification Committee of the International Headache Society. Cephalalgia 1988;8(suppl 7):1-96.

TABLE 3

Questions to Ask in Obtaining a Headache History

- Is this your first or worst headache? How bad is your pain on a scale of 1 to 10 (1 means not too bad, and 10 means very bad)? Do you have headaches on a regular basis? Is this headache like the ones you usually have?
- What symptoms do you have before the headache starts? What symptoms do you have during the headache? What symptoms do you have right now?
- When did this headache begin? How did it start (gradually, suddenly, other)?
- Where is your pain? Does the pain seem to spread to any other area? If so, where?
- What kind of pain do you have (throbbing, stabbing, dull, other)?
- Do you have other medical problems? If so, what?
- Do you take any medicines? If so, what?
- Have you recently hurt your head or had a medical or dental procedure?

Primary headache disorders (migraine, tension-type and cluster) are usually recurrent and have no organic disease as their cause.

lying organic diseases ranging from sinusitis to subarachnoid hemorrhage (*Table 2*).³

The primary task of the family physician is to determine whether a patient has an organic, potentially life-threatening cause of headache. In most instances, the physician can accurately diagnose a patient's headache and determine whether additional laboratory testing or neuroimaging is indicated by considering the various headache types in each category (primary or secondary), obtaining a thorough headache history and performing a focused clinical examination.

Headache History

Because most patients with headache have normal neurologic and general physical examinations, a thorough history is crucial to determining the etiology of a headache. The approach to the headache history given in *Table 3* and discussed in the following sections facilitates the generation of a differential

TABLE 4
Red Flags in the Evaluation of Acute Headaches in Adults

<i>Red flag</i>	<i>Differential diagnosis</i>	<i>Possible work-up</i>
Headache beginning after 50 years of age	Temporal arteritis, mass lesion	Erythrocyte sedimentation rate, neuroimaging
Sudden onset of headache	Subarachnoid hemorrhage, pituitary apoplexy, hemorrhage into a mass lesion or vascular malformation, mass lesion (especially posterior fossa mass)	Neuroimaging; lumbar puncture if neuroimaging is negative*
Headaches increasing in frequency and severity	Mass lesion, subdural hematoma, medication overuse	Neuroimaging, drug screen
New-onset headache in a patient with risk factors for HIV infection or cancer	Meningitis (chronic or carcinomatous), brain abscess (including toxoplasmosis), metastasis	Neuroimaging; lumbar puncture if neuroimaging is negative*
Headache with signs of systemic illness (fever, stiff neck, rash)	Meningitis, encephalitis, Lyme disease, systemic infection, collagen vascular disease	Neuroimaging, lumbar puncture,† serology
Focal neurologic signs or symptoms of disease (other than typical aura)	Mass lesion, vascular malformation, stroke, collagen vascular disease	Neuroimaging, collagen vascular evaluation (including antiphospholipid antibodies)
Papilledema	Mass lesion, pseudotumor cerebri, meningitis	Neuroimaging, lumbar puncture†
Headache subsequent to head trauma	Intracranial hemorrhage, subdural hematoma, epidural hematoma, post-traumatic headache	Neuroimaging of brain, skull and, possibly, cervical spine

HIV = human immunodeficiency virus.

*—Lumbar puncture may follow a negative neuroimaging procedure if suspicion of hemorrhage, infection or malignancy remains high.

†—Suspicion of specific central nervous system infections (Lyme disease, syphilis, etc.) or intracranial hypertension (pseudotumor cerebri) warrants lumbar puncture with cerebrospinal fluid analysis and pressure measurement.

Adapted with permission from Newman LC, Lipton RB. Emergency department evaluation of headache. *Neurol Clin* 1998;16:285-303.

diagnosis and preliminary classification of the headache type based on the criteria established by the International Headache Society.³ This level of detail is also necessary to identify “red flags” that suggest an underlying organic disorder as the cause of headache.⁵

FIRST OR WORST HEADACHE

The question “Is this your first or worst headache?” addresses the issue of new-onset headache and the age at which it becomes a

concern. Of the two headache classes, primary disorders are more common. These disorders can occur at any age but most often begin during childhood or between 20 and 50 years of age.⁶ Onset of headache after 50 years of age is a red flag for consideration of a secondary headache disorder such as temporal arteritis or a mass lesion (*Table 4*).⁶

Careful attention to and thoughtful consideration of neuroimaging and/or cerebrospinal fluid (CSF) analysis are mandatory

TABLE 5
Diagnostic Criteria for Cluster Headache

- A. At least five attacks fulfilling criteria B through D
- B. Severe unilateral orbital, supraorbital and/or temporal pain lasting 15 to 180 minutes (untreated)
- C. Headache associated with at least one of the following signs on the pain side:
 - 1. Conjunctival injection
 - 2. Lacrimation
 - 3. Nasal congestion
 - 4. Rhinorrhea
 - 5. Forehead and facial sweating
 - 6. Miosis
 - 7. Ptosis
 - 8. Eyelid edema
- D. Frequency of attacks: one attack every other day to eight attacks per day

Adapted with permission from Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. Headache Classification Committee of the International Headache Society. Cephalalgia 1988;8(suppl 7):1-96.

TABLE 6
Diagnostic Criteria for Episodic Tension-Type Headache

- A. At least 10 previous headache episodes fulfilling criteria B through D; number of days with such headaches: less than 180 days per year
- B. Headache lasting from 30 minutes to 7 days
- C. At least two of the following pain characteristics:
 - 1. Pressing or tightening (nonpulsating) quality
 - 2. Mild or moderate intensity
 - 3. Bilateral location
 - 4. No aggravation by walking stairs or similar routine physical activity
- D. Both of the following:
 - 1. No nausea or vomiting (anorexia may occur)
 - 2. Photophobia and phonophobia are absent, or one but not the other is present.

Adapted with permission from Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. Headache Classification Committee of the International Headache Society. Cephalalgia 1988;8(suppl 7):1-96.

when a patient of any age complains of a first or worst headache.⁷⁻⁹ If the patient routinely has headaches, it is important to determine whether the current episode is typical.

SYMPTOMS

The patient should be asked to describe current symptoms as well as symptoms experienced before and during the headache. This information can help the physician identify a primary headache disorder such as cluster headache (ipsilateral lacrimation and/or nasal congestion) or migraine with aura (e.g., scintillating scotomata, photophobia, phonophobia, nausea). It is important to note that most patients with migraine do not have an associated aura.

A potentially life-threatening secondary headache disorder may also be identified based on the patient's description of symptoms (diplopia, dimming of vision in a single eye, stiff neck, disorientation, rash, fever, eye pain, unilateral paresthesias, unilateral weakness, balance change, etc.). Symptoms suggesting a secondary headache disorder require further investigation.

ONSET

Questions should be asked about the time and nature of headache onset (e.g., gradual, sudden, subacute). Secondary headache disorders that may have a sudden, severe onset include subarachnoid hemorrhage, vascular malformations (ruptured or unruptured), acute ischemic cerebrovascular disorder or posterior fossa mass lesions.

LOCATION AND RADIATION OF PAIN

It is important to determine the location of a patient's pain and whether the pain radiates to another area. Cluster headaches are strictly unilateral (*Table 5*),³ whereas tension-type headaches are usually band-like and bilateral (*Table 6*).³ Migraines generally begin unilaterally but may progress to involve the entire head (*Table 7*).³

Pain along the distribution of the temporal

artery may suggest temporal arteritis, and pain along the distribution of the trigeminal nerve may be a sign of trigeminal neuralgia (tic douloureux). Eye pain may suggest acute glaucoma.

QUALITY OF PAIN

A patient's pain may be throbbing, stabbing, dull, pressure-like or other. Based on the patient's description of pain quality, the physician may be able to further classify the headache as migraine, tension-type or cluster (Tables 5, 6 and 7).³

CONCURRENT MEDICAL CONDITIONS

An organic cause of headache is more likely in patients with human immunodeficiency virus infection, cancer or another chronic medical condition (e.g., hypertension with a diastolic pressure higher than 110 mm Hg).¹⁰ Organic causes might include meningitis (chronic or carcinomatous), central nervous system (CNS) lymphoma, toxoplasmosis, metastases or intracranial vascular disorder. The patient who has an acute viral syndrome or an acute bacterial infection (e.g., sinusitis) often presents with acute headache in addition to disease-specific complaints.

MEDICATIONS

Prescription and over-the-counter medications (especially caffeine-containing analgesics) have been implicated as triggers for drug-rebound and nonspecific headaches.² Thus, it is important to review any medication that a patient is taking for its potential to cause headache. A search of the online *Physicians' Desk Reference*, 54th ed.,¹¹ yielded more than 1,000 references to medications with headache as a side effect.

Drug-related intracranial hypertension can occur with use of antibiotics (e.g., tetracycline, minocycline [Minocin], trimethoprim-sulfamethoxazole [Bactrim, Septra], nalidixic acid [NegGram]), corticosteroids and other drugs (e.g., isotretinoin [Accutane], tamoxifen [Nolvadex], cimetidine [Tagamet]).¹²

Cluster headaches are strictly unilateral, whereas tension-type headaches are usually band-like and bilateral. Migraines generally begin unilaterally but may progress to

RECENT TRAUMA OR PROCEDURES

Headache subsequent to trauma may signify a postconcussive disorder, although intracranial hemorrhage should always be suspected. Migraine and cluster headaches may be triggered by head trauma.⁶ Headache has also been associated with common medical procedures (e.g., lumbar puncture, rhino-

TABLE 7
Diagnostic Criteria for Migraine

Migraine without aura

- A. At least five attacks fulfilling criteria B through D
- B. Headache lasting 4 to 72 hours (untreated or unsuccessfully treated)
- C. At least two of the following pain characteristics:
 1. Unilateral location
 2. Pulsating quality
 3. Moderate or severe intensity
 4. Aggravation by walking stairs or similar physical activity
- D. During headache, at least one of the following:
 1. Nausea and/or vomiting
 2. Photophobia and phonophobia

Migraine with aura

- A. At least two attacks fulfilling criterion B
- B. At least three of the following characteristics:
 1. One or more fully reversible aura symptoms indicating focal cerebral cortical and/or brain-stem dysfunction
 2. At least one aura symptom develops gradually over more than 4 minutes, or two or more symptoms occur in succession.
 3. No aura symptom lasts more than 60 minutes; if more than one aura symptom is present, accepted duration is proportionally increased.
 4. Headache follows aura, with a free interval of less than 60 minutes (headache may also begin before or simultaneously with aura).

Adapted with permission from Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. Headache Classification Committee of the International Headache Society. Cephalalgia 1988;8(suppl 7):1-96.

Focal neurologic findings detected on the physical examination should be considered "red flags" and warrant additional evaluation.

scopy) and dental procedures (e.g., tooth extraction).

Physical Examination

The primary purpose of the physical examination is to identify causes of secondary headaches. The examination should target areas identified as abnormal during the headache history. The general physical examination should include vital signs, funduscopic and cardiovascular assessment, and palpation of the head and face.

A complete neurologic examination is essential, and the findings must be documented. The examination should include mental status, level of consciousness, cranial nerve testing, pupillary responses, motor strength testing, deep tendon reflexes, sensation, pathologic reflexes (e.g. Babinski's sign), cerebellar function and gait testing, and signs of meningeal irritation (Kernig's and Brudzinski's signs). Particular attention should be given to detecting problems related to the optic, oculomotor, trochlear and abducens nerves (cranial nerves II, III, IV and VI, respectively).

The Author

C. RANDAL CLINCH, D.O., is currently assistant professor and associate director of clinical operations in the Department of Family and Community Medicine at Wake Forest University School of Medicine, Bowman Gray Campus, Winston-Salem, N.C. Previously he was director of the predoctoral programs division in the Department of Family Medicine at the Uniformed Services University of the Health Sciences, F. Edward Hébert School of Medicine, Bethesda, Md. Dr. Clinch received a doctor of osteopathy degree from the University of Medicine and Dentistry of New Jersey School of Osteopathic Medicine, Stratford, N.J., and completed a family medicine residency at Somerset Medical Center, Somerville, N.J. He has also completed the National Institutes of Health's core course in clinical research.

Address correspondence to C. Randall Clinch, D.O., Department of Family and Community Medicine, Wake Forest University School of Medicine, Bowman Gray Campus, Medical Center Blvd., Winston-Salem, NC 27157-1084 (e-mail: crclinch@wfbumc.edu). Reprints are not available from the author.

Red Flags

Only a minority of headaches are secondary, but this category contains the most life-threatening diagnoses (Table 2).³ Although prospective studies are lacking, several publications have commented on historical and physical findings that are considered red flags for serious problems based on clinical experience^{2,5,6,9,10,13-15} (Table 4).⁶ Currently, these findings offer the best means of identifying a secondary headache disorder.

Focal neurologic findings should prompt additional evaluation. Among others, these findings include unilateral loss of sensation, unilateral weakness, unilateral hyperreflexia and papilledema.

Possible work-ups for various red flags are listed in Table 4.⁶ Limited laboratory testing might include a complete blood count when systemic or intracranial infection is suspected or an erythrocyte sedimentation rate (ESR) when temporal arteritis is a possibility. In temporal arteritis, the ESR is usually elevated to above 50 mm per hour; this disorder should be considered in all patients older than 50 years. CSF analysis is warranted in patients with red flags who have normal neuroimaging.

Random use of laboratory testing in the evaluation of acute headache is not warranted. In certain situations, referral to a headache subspecialist may be appropriate (Table 8).²

Neuroimaging

To provide quality yet cost-effective care, the physician needs to know when to order computed tomographic (CT) scanning or magnetic resonance imaging (MRI) in the evaluation of an adult patient with acute headache disorder. The Ambulatory Sentinel Practice Network,¹⁶ a group of community primary care practices in the United States and Canada, conducted a collaborative clinical research study to examine the reasons that physicians ordered CT scanning during the evaluation of headaches.

The study¹⁶ found that CT scans were

TABLE 8

Considerations for Referral to a Headache Specialist

Physician has inadequate level of comfort in diagnosing or treating patient's headache.
Patient requests a referral.
Initial diagnosis is in question.
Patient does not respond to treatment.
Patient's condition or disability continues or worsens.
Physician is unable to classify patient's headache according to diagnostic criteria for primary or secondary headache disorders.
Habituation or rebound headaches limit outpatient management.
Patient has intractable or daily headaches.

Information from Solomon GD, Cady RK, Klapper JA, Ryan RE. Standards of care for treating headache in primary care practice. National Headache Foundation. Cleve Clin J Med 1997;64:373-83.

ordered for approximately 3 percent of patients with headache. In most instances, CT scanning was ordered because a tumor (49 percent) or subarachnoid hemorrhage (9 percent) was suspected. Patient expectations and medicolegal concerns were the reasons for 17 percent of CT scans. Although almost one half of CT scans were ordered to search for a brain tumor, the evidence does not support this level of concern. Data from a prospective study¹⁷ revealed that isolated headache was the first and only clinical symptom in just 8.2 percent of patients with intracranial tumor.

Factors to consider in deciding whether to order CT or MRI studies include the need to identify acute hemorrhage (CT scanning is preferred), the need to evaluate the posterior fossa (MRI studies are preferred), general availability (CT scanning is more available) and cost and reimbursement issues (CT scanning is less expensive). Barring these factors, MRI is more sensitive than CT scanning in identifying pathologic intracranial changes. However, it is uncertain whether the identifi-

cation of additional pathology on MRI studies would improve outcomes, because the percentage of abnormalities noted on CT scans that potentially benefit from neurosurgical intervention is already extremely small (as low as 0.01 percent).⁹

The U.S. Headache Consortium¹⁸ recently developed evidence-based guidelines for the use of neuroimaging in patients with non-acute headache (i.e., headache occurring at least four weeks during a patient's lifetime). Grade A recommendations are based on multiple, well-designed, randomized clinical trials and a consistent relevant pattern of findings. Grade B recommendations are supported by some evidence from clinical trials, but supportive evidence is not optimal. Grade C recommendations are based on consensus in the absence of sufficient data from controlled trials.

According to the consortium's guidelines, neuroimaging should be considered in patients with nonacute headache and an unexplained abnormal finding on the neurologic examination (grade B recommendation). Neuroimaging is not usually warranted in patients with migraine and a normal neurologic examination (grade B recommendation). Because insufficient evidence was available, the consortium panel made no recommendations for neuroimaging in patients with or without neurologic symptoms, such as headache causing awakening from sleep (grade C recommendation).

Lumbar Puncture and Electroencephalography

CT scanning without contrast medium, followed by lumbar puncture if the scan is negative, is preferred to rule out subarachnoid hemorrhage within the first 48 hours. A negative CT scan and a negative lumbar puncture do not completely rule out subarachnoid hemorrhage because it may take hours for blood to enter the CSF after hemorrhage. If a relatively recent hemorrhage is suspected, the CSF should be evaluated for xanthochromia,

which is a yellow discoloration detectable on spectrophotometry. Xanthochromia may be present for at least a week after a subarachnoid hemorrhage.¹⁹

Lumbar puncture is useful for assessing the CSF for blood, infection and cellular abnormalities. It is also important for documenting abnormalities of CSF pressure that might be related to headache. Headaches are associated with low CSF pressure (less than 90 mm of water as measured by a manometer) and elevated CSF pressure (greater than 200 to 250 mm of water).¹⁹ Headaches related to CSF hypotension include those caused by post-traumatic leakage of CSF (i.e., after lumbar puncture or CNS trauma). Headaches related to CSF hypertension include those associated with idiopathic intracranial hypertension and CNS space-occupying lesions (i.e., tumor, infectious mass, hemorrhage).

The National Headache Foundation reports that electroencephalography (EEG) has “not been shown to effectively identify headache subtypes or headaches caused by structural defects.”^{2(p375)} Hence, routine use of EEG in the evaluation of headaches is not warranted.

The opinions expressed herein are the private views of the author and are not to be construed as official or as reflecting the views of the Uniformed Services University, U.S. Air Force or U.S. Department of Defense.

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