

## HEADACHE AS A PRESENTING SYMPTOM OF NEUROLOGICAL EMERGENCIES

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### Introduction

Headache as an initial manifestation of neurological emergencies represents a major clinical challenge, as it may be the first indicator of serious, life-threatening conditions requiring urgent intervention. Headaches are broadly classified into primary and secondary forms. Primary headaches, including migraine and tension-type headache, occur independently and are not associated with structural or systemic disease. In contrast, secondary headaches arise as a consequence of underlying pathological processes such as intracranial hemorrhage, cerebrovascular accidents, and central nervous system infections. Identifying specific headache features—particularly clinical “red flags” that suggest a secondary cause—is crucial for prompt diagnosis and timely management, ultimately improving patient outcomes.

Headache is one of the most common neurological complaints encountered in emergency departments, accounting for a substantial proportion of neurological consultations, highlighting its clinical significance in acute care settings. Sudden-onset, severe headaches, especially those described by patients as the “worst headache of my life,” are strongly associated with life-threatening conditions such as subarachnoid hemorrhage. In such cases, rapid diagnosis is essential, as delayed treatment is associated with high mortality rates.

Additionally, headaches frequently accompany acute cerebrovascular events, including ischemic stroke, and have been reported in a significant proportion of affected patients. This association emphasizes the importance of comprehensive clinical evaluation in individuals presenting with headache, even in the absence of focal neurological deficits. The diagnostic complexity in emergency settings lies in distinguishing benign primary headaches from secondary headaches that signal severe neurological pathology. Clinicians must integrate patient history, headache characteristics, and neurological examination findings to determine the need for neuroimaging and further investigations. Warning signs such as fever, neck stiffness, altered consciousness, or neurological deterioration warrant immediate medical assessment.

Although headaches are commonly encountered in clinical practice, those with acute or atypical features require meticulous evaluation to prevent misdiagnosis and treatment delays. Enhancing awareness among healthcare providers and the general population regarding the potential seriousness of headache symptoms may contribute to earlier detection, improved clinical outcomes, and reduced complications associated with neurological emergencies.

### Neurological Emergencies Associated with Headache

Headache is a common yet potentially alarming symptom that may signal the presence of an underlying neurological emergency. While many headaches are benign and self-limiting, certain headache presentations serve as early warning signs of serious intracranial pathology. Accurate recognition of headache characteristics, associated symptoms, and patient risk factors is essential for timely diagnosis and life-saving intervention.

### Subarachnoid Hemorrhage

One of the most critical headache-related neurological emergencies is subarachnoid hemorrhage. It classically presents as a sudden-onset, severe “thunderclap” headache that reaches maximal intensity within seconds to minutes and is frequently described by patients as the worst headache they have ever experienced. This presentation is most commonly caused by rupture of an intracranial aneurysm. Associated symptoms often include nausea, vomiting, neck stiffness, photophobia, and transient loss of consciousness. Early diagnosis, typically achieved through non-contrast computed tomography of the brain, is crucial because delayed recognition is associated with high morbidity and mortality. Even with modern medical care, subarachnoid hemorrhage remains a condition with substantial fatality and long-term neurological disability.

### **Stroke and Cerebral Ischemia**

Headache may also accompany acute cerebrovascular events, particularly ischemic stroke. Although focal neurological deficits are the hallmark of stroke, headache can be an initial or accompanying symptom in a significant proportion of patients. Headache is more frequently observed in posterior circulation strokes and appears to occur more commonly in women. The pain is often sudden in onset and may be moderate to severe, sometimes preceding or coinciding with symptoms such as weakness, sensory loss, visual disturbances, speech impairment, or altered consciousness. Because headache alone may be the presenting complaint, especially in early stages, clinicians must maintain a high index of suspicion when evaluating patients with new or atypical headache patterns.

### **Intracranial Hemorrhage**

Intracranial hemorrhage, including intracerebral and subdural bleeding, represents another life-threatening condition in which headache is a prominent symptom. These headaches are often severe and may be accompanied by vomiting, dizziness, decreased level of consciousness, or focal neurological signs. Risk factors such as hypertension, anticoagulant use, head trauma, and advanced age significantly increase the likelihood of hemorrhagic causes. Computed tomography remains the primary diagnostic tool, particularly when performed soon after symptom onset, as early detection is essential to prevent rapid neurological deterioration.

### **Red Flag Headache Features**

Certain headache characteristics strongly suggest a secondary cause and require urgent medical evaluation. These warning signs include sudden onset of severe pain, a marked change in a patient’s usual headache pattern, headaches following head injury, or headaches associated with fever, neck stiffness, confusion, seizures, or visual abnormalities. Headaches that awaken patients from sleep or occur for the first time in individuals over the age of 50 are particularly concerning, as they may indicate serious underlying conditions such as stroke, infection, or intracranial tumors.

### **Clinical Presentation and Risk Stratification**

Patients presenting with headache due to neurological emergencies often display specific high-risk features on history and examination. Abrupt onset, rapidly worsening intensity, and associated systemic or neurological symptoms significantly increase the likelihood of serious pathology. The presence of altered mental status, focal neurological deficits, or signs of meningeal irritation further supports the need for immediate diagnostic workup. Additionally, a history of malignancy, immunosuppression, or coagulation disorders raises suspicion for secondary headache causes.

### **Demographic Considerations**

Demographic factors also influence headache etiology in emergency settings. Younger individuals more frequently experience primary headache disorders, whereas older adults have a higher risk of secondary headaches linked to vascular, infectious, or neoplastic processes. Sex-related differences are also evident, with migraine occurring more commonly in women, while certain primary headache syndromes show male predominance. Awareness of these demographic trends aids clinicians in refining differential diagnoses and prioritizing investigations.

### **Management and Treatment of Headache in Neurological Emergencies**

The effective management of headache, particularly when it may indicate an underlying neurological emergency, requires a structured and multidisciplinary approach. Early recognition of high-risk features and prompt initiation of diagnostic and therapeutic measures are essential to reduce morbidity and mortality. Initial management priorities focus on patient stabilization, identification of secondary causes, and prevention of neurological deterioration.

### **Initial Assessment and Risk Identification**

The first step in managing patients presenting with headache is a thorough clinical assessment aimed at identifying warning signs suggestive of a serious underlying condition. Headaches characterized by sudden onset, rapidly escalating intensity, or a thunderclap presentation require immediate evaluation. Associated symptoms such as visual disturbances, altered mental status, fever, neck stiffness, seizures, or focal neurological deficits significantly increase the likelihood of secondary headache disorders and necessitate urgent investigation. Vital signs, level of consciousness, and a focused neurological examination are critical components of the initial evaluation.

### **Diagnostic Evaluation**

Accurate diagnosis is fundamental before initiating targeted treatment. A detailed medical history, including headache onset, progression, triggers, prior headache patterns, and associated systemic symptoms, guides clinical decision-making. Physical and neurological examinations help localize pathology and assess disease severity. Neuroimaging plays a central role in excluding life-threatening causes, with non-contrast computed tomography serving as the first-line modality in suspected intracranial hemorrhage or acute stroke. Magnetic resonance imaging may be employed when initial imaging is inconclusive or when vascular, inflammatory, or neoplastic etiologies are suspected. Laboratory investigations, including inflammatory markers and cerebrospinal fluid analysis when indicated, further aid in establishing the diagnosis.

### **Supportive Care and Preventive Strategies**

Supportive management is essential across a wide range of headache-related conditions. In infectious causes such as viral meningitis, treatment is primarily supportive and includes adequate hydration, electrolyte balance, pain control, and close neurological monitoring. Preventive therapy is particularly important in patients with chronic or recurrent headache disorders, where the goal is to reduce attack frequency, severity, and functional impairment. In chronic tension-type headache, prophylactic treatment with tricyclic antidepressants has demonstrated effectiveness, while selected anticonvulsants may provide benefit in certain patient populations. Preventive strategies should be individualized, taking into account comorbid conditions, medication tolerability, and patient preferences.

### **Acute Treatment Approaches**

Acute management of headache aims to provide rapid symptom relief while addressing the underlying cause. Mild to moderate headache episodes are commonly treated with non-steroidal anti-inflammatory drugs or acetaminophen, either alone or in combination. In emergency settings, prompt pain control is essential not only for patient comfort but also to facilitate accurate neurological assessment. Severe or refractory headaches may require parenteral therapy and close observation, particularly when secondary causes have not yet been fully excluded. Caution is required to avoid medication overuse, which can exacerbate headache disorders and complicate long-term management.

### **Advanced and Innovative Care Models**

Recent advances in headache management emphasize the importance of integrated and patient-centered care models. Multidisciplinary approaches involving neurologists, emergency physicians, pain specialists, and primary care providers improve diagnostic accuracy and treatment outcomes. The incorporation of telemedicine has expanded access to specialized headache care, particularly for patients in remote or underserved areas. Emerging care models prioritize timely assessment, individualized treatment pathways, and continuity of care to reduce delays in diagnosis and optimize therapeutic outcomes. Ongoing research into novel pharmacological agents and neuromodulation techniques continues to advance the field, underscoring the need for clinicians to remain informed about evolving treatment options.

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