Diagnostic Testing and Treatment of Pediatric Headache in the Emergency Department

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Objective To describe the variability in diagnostic testing and treatment of headaches in children presenting to the emergency department (ED) with use of a nationally representative sample.

Study design This was a retrospective cohort study using the National Hospital Ambulatory Medical Care Survey during 2005-2009. To assess the use of evidence-based treatment, we analyzed all patients <18 years old in 2 groups: (1) primary discharge diagnosis of headache and (2) discharge diagnosis of migraine.

Results Four hundred forty-eight sampled ED visits from 2005-2009 represented a national estimate of 1.7 million visits with a discharge diagnosis of headache. A total of 95 visits represented a national estimate of 340 000 visits with a discharge diagnosis of migraine. Median age was 13.1 years and 60% were female with a primary diagnosis of headache. In this group, neuroimaging was performed in 37% of patients and 39% underwent blood tests. Nonsteroidal anti-inflammatory drugs and opioids were most commonly used for treatment. For children with a discharge diagnosis of migraine, approximately 40% of patients received non–evidence-based treatment, most commonly with opioid medications, and >20% of patients underwent computed tomography scanning.

Conclusions There is significant variability in the evaluation and treatment of pediatric headache in the ED. Despite evidence-based clinical guidelines for migraine headache, a large number of children continue to receive opioids and ionizing radiation in the ED. *(J Pediatr 2013;163:1634-7)*.

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Pediatric headaches are a common occurrence and increase in incidence as a child ages. Epidemiologic studies have shown that 30%-60% of children through adolescence will have headaches.[1-3] A recent study showed that 40% of children who present to the emergency department (ED) with a headache have a primary headache disorder, with migraine being the most common (74%).[4] When children present to the ED for acute headache management, physicians must decide on the need for a diagnostic evaluation as well as symptomatic treatment.

Emergency physicians may not consider the specific types of headache disorders due to the focus on ruling out emergencies, and they likely use migraine therapies given it is the most common primary headache disorder. The American Academy of Neurology has endorsed clinical guidelines for abortive migraine treatment that have not changed significantly in the past decade.[5] The abortive evidence-based treatments (EBTs) for headache that are available range from acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDs) to 5-hydroxytryptamine receptor agonists (triptans) for pain control. In addition, many of the dopamine antagonists such as metoclopramide and prochlorperazine have been shown to have a significant therapeutic effect in migraine.[6-11] New therapies on the horizon include inhaled botulinum toxin, low-dose propofol, and new routes of administration for triptans.[12-14] Despite official recommendations and EBT guidelines available to ED providers, the ED management of pediatric headache is highly variable.[6]

The primary outcome of this analysis was to describe pediatric headache treatment in US EDs. Secondary outcomes included describing the diagnostic evaluation children with headache receive and whether those with migraine in particular receive treatments supported by evidence-based guidelines. We hypothesized that pediatric headache treatment remains variable in the US, with many patients receiving treatments that are not evidence based.

CBC	Complete blood cell count
CT	Computed tomography
EBT	Evidence-based treatment
ED	Emergency department
NHAMCS	National Hospital Ambulatory Medical Care Survey
NSAID	Nonsteroidal anti-inflammatory drug

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Methods

This is a retrospective cross-sectional study using the National Hospital Ambulatory Medical Care Survey (NHAMCS) data from 2005-2009. This study was approved by the Institutional Review Board at Oregon Health and Science University.

The NHAMCS group patients by diagnosis using *International Classification of Disease, Ninth Edition* codes. We obtained our study population by searching the database for patients with a primary discharge diagnosis of headache or migraine. Our patient population ranged from 0-17 years of age. Subjects were excluded if they had a diagnosis code for trauma or central nervous system neoplasm. We secondarily examined the cohort with a specific discharge diagnosis of migraine. Other patient-based variables analyzed included age, sex, and disposition from the ED.

In the US, the NHAMCS is a public-use database that collects data from ED visits. It is a population-based, stratified sample survey of ED visits in the US. Weights are applied to each visit by the National Center for Health Statistics to produce national annual estimates. A detailed description of the NHAMCS methodology is available from the National Center for Health Statistics.[15]

Outcomes

The NHAMCS lists diagnostic studies performed, including blood tests and imaging, though it does not report results of these tests. Our analysis included use of laboratory testing, diagnostic imaging, and electrocardiography.

Up to 8 medications given in the ED are recorded in the database including intravenous fluids. We grouped medications by general class and subanalyzed specific drugs of interest including NSAIDs, acetaminophen, intravenous and oral opioids, opioid partial agonists (eg, nalbuphine), meperidine, triptans, dopamine antagonists (eg, metoclopramide), corticosteroids, ondansetron, barbiturate-containing drugs (eg, acetaminophen, butalbital, and caffeine), and antibiotics. Our subgroup of patients with migraine headache was analyzed to determine if they received EBT that has been reported in other studies.[5,7,8] For this study, we defined EBT as the administration of an NSAID, dopamine antagonist, or triptan medication as supported by the American Academy of Neurology and the referenced studies.

Statistical Analyses

All calculations incorporated the strata, cluster, and weight from the probability sample, although the population sample sizes reported in Tables I and II are the absolute numbers from NHAMCS. Using survey analysis, nationally representative estimates were made for the annual number of ED visits for nontraumatic pediatric headache and migraine. To compare treatment between patients with a discharge diagnosis of migraine and those with a headache diagnosis, we used the Rao-Scott χ^2 test as a conservative estimate of the χ^2 statistic in survey analysis. SAS version 9.2 (SAS Institute, Cary, North Carolina) was used for all analyses.

Table I. Diagnostic tests and treatment of all pediatric headaches

Diagnostic test	Percentage of patients	Treatment	Percentage of patients
CT	35	NSAIDs	40
Magnetic resonance imaging	1	Opioid	27
CBC	25	Dopamine antagonist	27
Urinalysis	20	Acetaminophen	16
Electrolytes	14	Antibiotic	10

Results

From 2005-2009, there were 448 ED visits with a primary discharge diagnosis of headache or migraine in patients <18 years old, representing approximately 1.7 million ED visits in the US with a discharge diagnosis of headache or migraine over this time period. The median age was 13.1 years with a female predominance (60%).

Of these 448 ED visits, 95 had a discharge diagnosis of migraine headache, representing a national estimate of 340 000 ED visits. The average age of the migraine cohort was 14.3 years. Of the 95 visits with a discharge diagnosis of migraine, 38 had a matching chief complaint of migraine headache.

Of all children diagnosed with headache, 2.4% were admitted to the hospital and the rest were discharged from the ED; 1.5% of the study cohort did not have a disposition recorded. Hospital discharge diagnoses for admitted patients included epilepsy, migraine, headache, benign intracranial hypertension, and viral meningitis.

Diagnostic Testing–All Headache

Many patients underwent some form of diagnostic testing (Table I). The most frequent test performed was diagnostic imaging with computed tomography (CT). The use of CT (35%) and measurement of complete blood cell count (CBC) (24%) and electrolytes (14%) were no different

Table II. Treatment of pediatric patients with final primary diagnosis of headache vs migraine

Drug	Diagnosis, % of patients		
	Migraine (n = 95)	Headache (n = 353)	*P*
Dopamine antagonist	64	18	<.001
Ibuprofen	9.7	28	<.001
Ketorolac	32	12	<.001
Meperidine	7.6	0.43	<.001
Intravenous opioid	8.9	8.1	.83
Oral opioid	12	8.7	.38