





1.0
ANCC
CONTACT HOUR

Acute migraine headache in children

By Kaitlyn E. Sahd-Brown, BSN, RN, CPN, and Lisa A. Ruth-Sahd, DEd, RN, MSN, CEN, CCRN

PAIN IS A subjective experience, so assessment of acute migraine pain relies largely on verbal self-report. However, this may be challenging in children who often present with signs and symptoms of migraine around age 6 years.¹ Patients who can't convey their pain verbally are at risk for underassessment and undertreatment. This article describes the incidence and risk factors for migraine in children, discusses the pathophysiology of migraine, and provides an evidence-based approach to assessment and treatment of migraine pain in children.¹ Episodic syndromes that may be associated with migraine and other pediatric migraine variants are beyond the scope of this article.

Migraine in children

The most common disabling primary headache disease that occurs in children and adolescents, migraine is characterized by a throbbing headache often accompanied by photophobia, phonophobia, nausea, vomiting, and movement sensitivity.² It's the third most prevalent disease in the world and affects 12% of children.³

Migraine headaches have been reported in children as young as 18 months. Ten percent of school-age children experience migraine headaches; half of them have their first migraine headache before age 12. Before puberty, boys are affected more often than girls. As adolescence approaches, the incidence

increases more rapidly in girls. By age 17, as many as 8% of boys and 23% of girls have experienced a migraine headache.³

Risk factors

Although the exact etiology of migraine is unclear, the American Migraine Foundation notes that genetics, environmental factors, stress, and psychological issues may play a role in its development.⁴ If a family member suffers from migraine, the child is almost two times more likely to suffer as well.^{2,4-6}

Behavioral and psychiatric problems also put a child at risk for migraine.^{2,6,7} Adolescents with migraine have an increased risk for affective disorders and attention-deficit hyperactivity

disorders. Adolescents with headaches have a higher risk for psychopathologic disturbances and suicidal thoughts.⁵

Emotional stress from family and life factors also put a child at increased risk for migraine. Physical, sexual, and emotional stress increase the frequency of headaches; stress at school as well as high parental expectations add to the risk.^{1,2,4,6,8,9} Additional triggers for migraine include changes in weather, hormonal changes in girls, and environmental loud sounds and bright lights.^{10,11}

Pathophysiology

Migraine is thought to be a primary event in the brainstem that leads to diffuse projections from the locus coeruleus to other parts of the brain, leading to an unstable trigemino-vascular reflex. This causes increased discharge of the spinal nucleus of the trigeminal nerve and basal thalamic nucleus. When migraine occurs, blood flow increases in the cingulate in the cerebral hemispheres, auditory and visual cortices, and brainstem. Antidromic rather than orthodromic (or normal) trigeminal nerve stimulation results in the release of substance P, calcitonin gene-related peptide, and other peptides, leading to vasodilation and pain. These events lead to neurogenic inflammation.¹³

Migraine auras represent progressive neurologic deficits or disturbances with subsequent complete recovery. They may involve visual, sensory,

Behaviors suggesting pain in children

| Objective data | Behavioral changes* |
|---------------------------------|---|
| Autonomic signs | Pallor, change in vital signs (tachycardia, hypertension, tachypnea) |
| Facial grimacing | Rapid blinking, covering eyes and ears, frightening or distorted expression, brow lowering, clenched teeth, orbital tightening, upper-lip raising, nose wrinkling, eye narrowing or closure |
| Vocalizations | Screaming, crying, moaning, sighing |
| Body movements | Altered gait/limping, rubbing ears or head, tense tone/rigidity, decreased movement, guarding, pacing, rocking, fidgeting, repetitive movement |
| Interpersonal interactions | Resisting personal care, aggression, withdrawal/isolation |
| Change in mood and mental state | Delirium, depressive symptoms, agitation, anxiety, irritability, impaired executive functioning, declining cognition, exacerbation of cognitive impairment |
| Change in activity pattern | Sleep disturbances, disengagement with social activities, wanting to stay in bed, change in normal routine |
| Change in function | Decreased ability to engage in activities of daily living and wanting a dark quiet room. |

*Intensity of behaviors and actions varies with the intensity of the pain.

Source: Manworren RC, Stinson J. Pediatric pain management, assessment and evaluation. *Semin Pediatr Neurol.* 2016; 23(3):189-200.

speech and/or language, motor, brainstem, and/or retinal symptoms and may occur in approximately 25% of those experiencing migraine.^{4,8} Migraine with typical aura consists of visual and/or sensory and/or speech/language symptoms but no motor weakness. Migraine aura is thought to be caused by cortical spreading depression, which leads to the activation of the afferents of the trigeminal nerve and impacts the permeability of the blood-brain barrier (BBB) by the activation and upregulation of the matrix metalloproteinase (MMP).

The MMP, also called matrixins, is a group of zinc-dependent enzymes responsible for protein breakdown that's increasingly active in individuals with migraine. This breakdown causes hyperalgesia and is important in the generation of pain.¹² Once the BBB becomes more permeable, potassium, nitric oxide, adenosine, and other factors, such as substance P and calcitonin, sensitize the trigeminal afferent nerve.¹¹

Repeated migraines cause neuroplastic changes within the brain's

structure and tissue, causing functional changes within the brain cells.¹⁴ This primary neuronal dysfunction increases sensitivity to a wide variety of stimuli.

Pediatric assessment considerations

Although pain is challenging to assess in children, nurses must believe children and adolescents when they complain of migraine.¹⁵ Many patients are frequently undertreated and labeled as being depressed or having school-avoidant behavior.^{8,13}

The nurse must be aware of non-verbal behaviors suggesting pain because younger children can't verbalize pain. The Wong-Baker FACES Pain Rating Scale, validated in children age 3 years and over, and the Faces, Legs, Activity, Cry, and Consolability (FLACC) Behavioral Scale for children between age 2 months and 7 years are also helpful in assessing pediatric patients (see *Pain assessment tools*).^{7,10} According to the Acute Pain Management Guidelines, pain should be assessed every 15 minutes until

Pain assessment tools

FLACC Behavioral Scale

http://prc.coh.org/PainNOA/Flacc_Tool.pdf

PedMIDAS

www.cincinnatichildrens.org/service/h/headache-center/pedmidas

PedsQL

www.pedsql.org

Wong-Baker FACES Pain Rating Scale

www.wongbakerfaces.org

the patient is pain-free during rest and movement.¹⁶ Pain should then be monitored every hour for 6 hours until the patient is pain-free during rest and movement and then progress to assessments every 4 hours.^{10,17-19}

Although pain scales assess pain, they don't quantify fear, which is an important factor in children. Fear may be indicated by increases in heart rate and BP.

Other validated pain assessment tools include the Pediatric Migraine Disability Assessment (PedMIDAS), a 6-item questionnaire that's a reliable and objective measure of school- and socialization-related disability in school-aged children and adolescents on school days.²⁰ A PedMIDAS score above 30 indicates a moderate-to-severe headache.

Another instrument to facilitate assessment is the Pediatric Quality of Life Inventory (PedsQL), a 23-question instrument that evaluates parent and child responses to physical, emotional, social, and school health.²¹ Lower scores indicate poorer health-related quality of life. When using a tool to assess pain in children, consider patient ethnicity and culture, primary language, setting of care, and your comfort level with the tool. The tools should be used at rest, during movement, and during activity.

Signs and symptoms in children

Migraine is usually bilateral in childhood and unilateral in adolescence and adulthood. The frontotemporal area is the most common site of pain for children; occipital headaches in children are rare and raise diagnostic caution for the possibility of structural lesions.^{1,8}

Infants may present with periodic "head banging." Preschool children present with an ill appearance, vomiting, sleepiness, and irritability, and may cry and rock back and forth. Children ages 5 to 10 years may present with bilateral head pain in



The frontotemporal area is the most common site of pain for children; occipital headaches in children are rare.

the frontal or temporal area lasting 1 to 48 hours, wanting to sleep, nausea, vomiting, phonophobia, photophobia, thirst, excessive diaphoresis, polyuria, tearing, and edematous nasal passages as well as difficulty concentrating or thinking (see *Behaviors suggesting pain in children*).^{1,2,4,5,15}

Diagnosis

Serious causes of headache, such as tumor, intracranial hemorrhage or hypertension, congenital malformations, and central nervous system infections, are rare.^{4,6}

Imaging should be performed if neurologic examination findings are abnormal, or if the child's history indicates elevated intracranial pressure (ICP) (diplopia, ataxia, or worsening of headache when supine). Children with a history (more than 6 months) of typical intermittent headaches and a normal examination usually don't need neuroimaging.²

When migraine is suspected, a thorough neurologic exam, including a fundoscopic exam, is needed to rule out increased ICP and other neurologic pathology. The need for neuroimaging should be considered on a case-by-case basis following guidelines from the American Academy of Neurology and the American College of Radiology.^{2,4,10,20} The child should have normal general physical and neurologic examinations to rule out other causes of headache.² Diagnosing migraine is often challenging in young children, who may not be able to describe their symptoms, or in patients with migraine variants who may not have typical symptoms.²

According to the International Headache Society (IHS) classifications, episodic migraine lasts less than 15 days per month, whereas chronic migraine is a headache occurring on 15 or more days per month and lasting more than 3 months. New-onset migraine is a new migraine with a less-than-3-month duration without other causes for head pain.^{1,5,9} Migraines in children and adolescents may last 2 to 72 hours; the headache is more often bilateral than in adults.

The International Classification of Headache Disorders (ICHD) and the IHS also classify migraine as presenting with or without an aura (see *Diagnostic criteria for migraine*).

Acute treatment of migraine

General measures. When migraine symptoms develop, the child should rest or sleep in a dark, quiet room with a cool cloth applied to the forehead.¹⁹

Pharmacotherapy. Pharmacologic treatment should be initiated as soon as possible to control pain. For mild-to-moderate migraine attacks not associated with vomiting or severe nausea, analgesics are first-choice agents because they're effective, inexpensive, and less likely to cause adverse reactions than migraine-specific drugs such as triptans. If mild-to-moderate attacks are associated with

severe nausea or vomiting, an oral or rectal antiemetic drug can be used along with simple or combination analgesics.¹⁹ I.V. ketorolac may also be beneficial for pediatric migraine. In children ages 2 to 16 years, ketorolac is approved for use only as a single I.M. or I.V. dose.¹⁹ For moderate-to-severe migraine, serotonin (5-HT) 1B/1D receptor agonist (triptans) indicated for the acute treatment of migraine with or without aura include rizatriptan (approved by the FDA for children as young as 6 years) and almotriptan (approved by the FDA for children as young as 12 years).^{2,8} Opioids, barbiturates, and benzodiazepines shouldn't be given to children due to their addictive properties and potential to cause adverse reactions, including respiratory depression.^{19,22}

In children, use of I.V. dihydroergotamine (DHE), an ergotamine preparation, is usually restricted to the treatment of protracted migraine

that hasn't responded to other therapies.¹⁹ Common adverse reactions include nausea and anxiety; dyskinesia occurs infrequently. Patients should be pretreated with antiemetic medication such as prochlorperazine or metoclopramide 30 minutes prior to each dose of DHE.¹⁹

Complications

Patients must also be assessed for complications of migraine, which include *status migrainosus* (a debilitating migraine attack lasting for more than 72 hours); persistent aura without infarction, where the patient experiences aura symptoms for 1 week or more without neuroimaging signs of infarction; *migrainosus infarction*, where there are one or more migraine aura symptoms associated with an ischemic brain lesion noted on neuroimaging; and *migraine aura-triggered seizure*, where the patient has a seizure triggered by an attack of migraine with aura.¹⁹

Holistic nursing care

Nurses have a responsibility to implement holistic care for children and their families.²³ Pain management is especially important for younger patients who are at risk for undertreatment.²⁴ Collaborating with child life, social work, psychology, and psychiatry departments can help nurses provide holistic care.^{19,24-26}

Patient-family centered teaching

Patients and families should be educated regarding trigger identification (such as seasonal weather changes, caffeine, bright or flashing lights, odors, and medications) and avoidance, and treatment of migraine.^{24,27} Suggest that the patient or parents maintain a headache diary or calendar noting the date, time, type, and intensity of headache; preceding signs and symptoms; and possible triggers such as foods eaten, lack of sleep, menstruation, dehydration, and other physical or emotional stressors. They should also note how long the headache lasted and what alleviated the pain. The National Headache Foundation has a headache diary that can be downloaded online at www.headaches.org/headache-diary-keeping-a-diary-can-help-your-doctor-help-you. Apps for mobile devices that track headaches can be downloaded to encourage documentation.

Stress management and the importance of sleep should be emphasized in patient and family teaching. Stress causes over 70% of migraines, and lack of sleep causes over 69% of migraines.^{11,28,29}

Nurses play a role in educating children and families regarding realistic expectations about migraine management. Although pharmacotherapy lessens the impact of migraine, it doesn't eliminate the underlying pathology.³⁰ Equipped with accurate, thoughtful assessments, nurses can develop patient-centered care plans aimed at reducing pain

Diagnostic criteria for migraine

Migraine without aura

At least five attacks that include:

- a headache lasting 4 to 72 hours (untreated or unsuccessfully treated)
- a headache that has at least two of the following characteristics: unilateral location; pulsating quality; moderate or severe pain intensity; or aggravation by or causing avoidance of routine physical activity (e.g., walking or climbing stairs)
- a headache with nausea and/or vomiting
- photophobia and phonophobia

Migraine with aura

At least two attacks with one or more of the following:

- fully reversible aura symptoms: visual; sensory; speech and/or language; motor; brainstem; retinal
- at least two of the following four characteristics: at least one aura symptom spreads gradually over ≥ 5 minutes, and/or two or more symptoms occur in succession; each individual aura symptom lasts 5 to 60 minutes; at least one aura symptom is unilateral; the aura is accompanied, or followed within 60 minutes, by headache

Features of migraine in children and adolescents

- attacks may last 2 to 72 hours*
- headache is more often bilateral than in adults; an adult pattern of unilateral pain usually emerges in late adolescence or early adulthood
- occipital headache is rare and raises diagnostic caution for structural lesions
- photophobia and phonophobia may be inferred from behavior in young children.

*The evidence for untreated durations of less than 2 hours in children has not been substantiated.

Adapted from Headache Classification Committee of the International Headache Society. The International Classification of Headache Disorders, 3rd edition (beta version). *Cephalalgia*. 2013;33(9):629-808.

and minimizing suffering while maximizing quality of life. These care plans should be documented in the patient medical record to enhance continuity of care. ■

REFERENCES

1. Headache Classification Committee of the International Headache Society. The International Classification of Headache Disorders, 3rd edition (beta version). *Cephalalgia*. 2013;33(9):629-808.
2. Gelfand A. Pathophysiology, clinical features, and diagnosis of migraine in children. UpToDate. 2017. www.uptodate.com.
3. Migraine Research Foundation. About migraine in kids and teens. www.migraine-research-foundation.org/about-migraine-in-kids-and-teens.
4. O'Brien H. Classification of migraine in children. UpToDate. 2017. www.uptodate.com.
5. Straube A, Heinen F, Ebinger F, von Kries R. Headache in school children: prevalence and risk factors. *Dtsch Arztebl Int*. 2013;110(48):811-818.
6. American Migraine Foundation. Living with migraine. <https://americanmigrainefoundation.org/living-with-migraines>.
7. Arruda MA, Arruda R, Guidetti V, Bigal ME. Psychosocial adjustment of children with migraine and tension-type headache: a nationwide study. *Headache*. 2015(suppl 1):39-50.
8. Harding A, Clark L. Pediatric migraine: common, yet treatable. *Nurse Pract*. 2014;39(11):22-31.
9. Bailey B, Trottier ED. Managing pediatric pain in the emergency department. *Paediatr Drugs*. 2016;18(4):287-301.
10. Bonthius DJ, Lee AG, Hershey AD. Headache in children: approach to children and general

management strategies. UpToDate. 2017. www.uptodate.com.

11. Neut D, Fily A, Cuvellier JC, Vallée L. The prevalence of triggers in paediatric migraine: a questionnaire study in 102 children and adolescents. *J Headache Pain*. 2012;13(1):61-65.
12. Lakhan SE, Avramut M. Matrix metalloproteinases in neuropathic pain and migraine: friends, enemies, and therapeutic targets. *Pain Res Treat*. 2012;2012:952906.
13. Patniyot IR, Gelfand AA. Acute treatment therapies for pediatric migraine: a qualitative systematic review. *Headache*. 2016;56(1):49-70.
14. Yonker M, Mangum T. Migraine management in children. *Curr Neurol Neurosci Rep*. 2015;15(5):20.
15. Trottier ED, Bailey B, Lucas N, Lortie A. Diagnosis of migraine in the pediatric emergency department. 2013;49(1):40-45.
16. Twycross A. Guidelines, strategies and tools for pain assessment in children. *Nurs Times* [online]. 2017;113:5:18-21.
17. Malviya S, Voepel-Lewis T, Burke C, Merkel S, Tait AR. The revised FLACC observational pain tool: improved reliability and validity for pain assessment in children with cognitive impairment. *Paediatr Anaesth*. 2006;16(3):258-265.
18. Chetty S, Frohlich E, Penfold P. Acute pain guidelines. *Prof Nurse Today*. 2017;21(2):29-46.
19. Mack KJ. Acute treatment of migraine in children. UpToDate. 2017. www.uptodate.com.
20. Heyer GL, Merison K, Rose SC, Perkins SQ, Lee JM, Stewart WC. PedMIDAS-based scoring underestimates migraine disability on non-school days. *Headache*. 2014;54(6):1048-1053.
21. Varni JW, Seid M, Rode CA. The PedsQL: measurement model for the pediatric quality of life inventory. *Med Care*. 1999;37(2):126-139.
22. American Migraine Foundation. Understanding migraine: how to treat children with migraine. <https://americanmigrainefoundation.org/understanding-migraine/how-to-treat-children-with-migraine>.

americanmigrainefoundation.org/understanding-migraine/how-to-treat-children-with-migraine.

23. Craddock L, Ray LD. Pediatric migraine teaching for families. *J Spec Pediatr Nurs*. 2012;17(2):98-107.
24. Powers SW, Coffey CS, Hershey AD. Treatment of pediatric migraine. *N Engl J Med*. 2017;376(14):1388-1389.
25. Mathew PG, Krel R, Buddhdev B, et al. A retrospective analysis of triptan and the use for basilar and hemiplegic migraine. *Headache*. 2016;56(5):841-848.
26. Hickman C, Lewis KS, Little R, Rastogi RG, Yonker M. Prevention for pediatric and adolescent migraine. *Headache*. 2015;55(10):1371-1381.
27. American Migraine Foundation. Understanding migraine: top 10 migraine triggers and how to deal with them. <https://americanmigrainefoundation.org/understanding-migraine/top-10-migraine-triggers-and-how-to-deal-with-them>.
28. Mauro RD. Treatment of pediatric migraine. *N Engl J Med*. 2017;376(14):1388.
29. Ernst MM, O'Brien HL, Powers SW. Cognitive-behavioral therapy: how medical providers can increase patient and family opened and access to evidence-based multimodal therapy for pediatric migraine. *Headache*. 2015;55:1382-1396.
30. Robertson WC. Migraine in children. Medscape. 2018. <https://medicine.medscape.com/article/1179268-overview#a16>.

Kaitlyn E. Sahd-Brown is a nurse at Penn State Children's Hospital in Hershey, Pa., and adjunct nursing instructor at Pennsylvania College of Nursing and Health Sciences in Lancaster, Pa. Lisa A. Ruth-Sahd is a professor of nursing at York College of Pennsylvania and Penn Medicine/Lancaster General Health in York, Pa.

The authors and planners have disclosed no potential conflicts of interest, financial or otherwise.

DOI-10.1097/01.NURSE.0000531003.09848.00

> For more than 179 additional continuing education articles related to pediatric topics, go to NursingCenter.com/CE. <



Earn CE credit online:
Go to www.nursingcenter.com/CE/nursing and receive a certificate within minutes.

INSTRUCTIONS

Acute migraine headache in children

TEST INSTRUCTIONS

- To take the test online, go to our secure website at www.nursingcenter.com/ce/nursing. View instructions for taking the test online there.
- If you prefer to submit your test by mail, record your answers in the test answer section of the CE enrollment form on page 30. You may make copies of the form. Each question has only one correct answer. There is no minimum passing score required.
- Complete the registration information and course evaluation. Mail the completed form and registration fee of \$12.95 to: **Lippincott Professional Development**, 74 Brick Blvd., Bldg. 4, Suite 206, Brick, NJ 08723. We will mail your certificate in 4 to 6 weeks. For faster service, include a fax number and we will fax your certificate within 2 business days of receiving your enrollment form.
- You will receive your CE certificate of earned contact hours and an answer key to review your results.
- Registration deadline is March 6, 2020.

DISCOUNTS and CUSTOMER SERVICE

- Send two or more tests in any nursing journal published by Lippincott Williams & Wilkins together by mail, and deduct \$0.95 from the price of each test.
- We also offer CE accounts for hospitals and other healthcare facilities on nursingcenter.com. Call **1-800-787-8985** for details.

PROVIDER ACCREDITATION

Lippincott Professional Development will award 1.0 contact hour for this continuing nursing education activity.

Lippincott Professional Development is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation.

Lippincott Professional Development is also an approved provider of continuing nursing education by the District of Columbia, Georgia, and Florida CE Broker #50-1223. This activity is also provider approved by the California Board of Registered Nursing, Provider Number CEP 11749 for 1.0 contact hour.