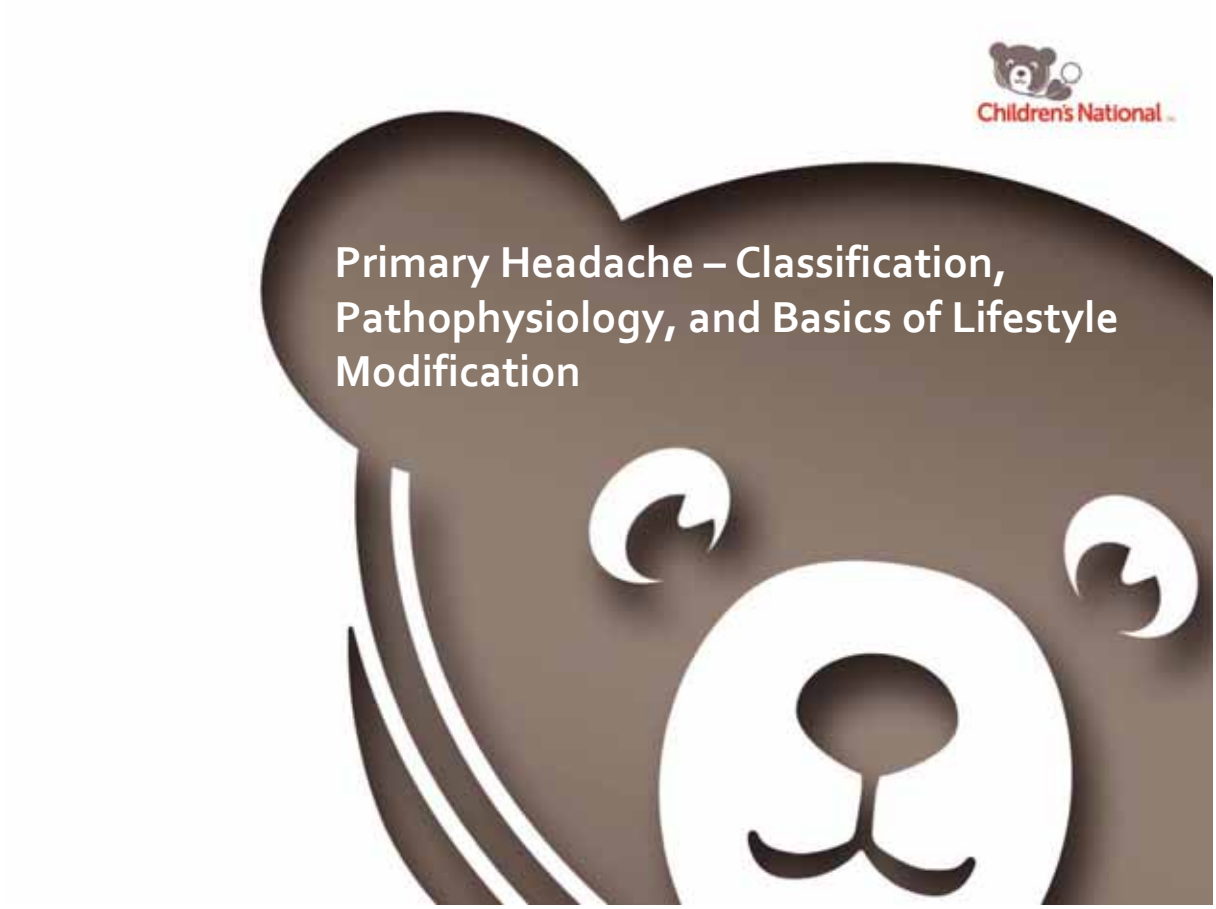

Marc DiSabella, DO
Program Director, Pediatric Neurology Fellowship
Director, Headache Program
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Children's National Health System

Disclosures:
I have no outside funding sources to claim.

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Objectives

- Define characteristics of primary headache
- Identify indications for ordering neuroimaging tests in headache patients
- Discuss management of primary headache disorders
- Discuss recommendations for referral to the Headache Program at Children's National

Children's National

Headache is Common

Migraine without aura – 20-28% of adolescents

- ICHD-II definition
- Neurol Clin. 2009; 27: 481–501

Chronic daily headache - 2-4% of adolescents

- Defined as >15 headaches per month > 3months
- Arch Pediatr. 2008 Dec;15(12):1805-14

Chronic migraine - 1% of adolescents

- Defined as >15 migraines per month > 3months
- Headache. 2011 May;51(5):693-706.

Medication overuse headache - 1.75% of adolescents

- Defined as >15 headaches per month in setting of abortive medication use > 15 days per month > 3months
- Headache. 2011 May;51(5):693-706.

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Primary or Secondary?

Primary or Secondary Headache?

Primary Headache

- No other causative disorder

- Migraine headache
- Tension headache
- Cluster headache

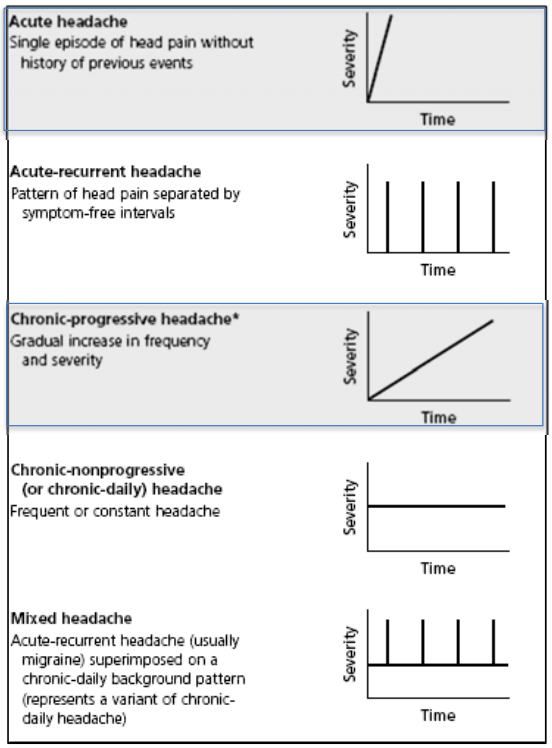
Secondary Headache

- Caused by another disorder

- Medication overuse headache
- Hydrocephalus
- Brain tumor
- Hemorrhage
- Meningitis

Temporal Profile of Primary and Secondary Headaches

Rothner AD. The evaluation of headaches in children and adolescents. Semin Pediatr Neurol 1995;2:109-118.



*Possible Secondary Headache -Tumor, Hemorrhage

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Pediatric Headache: Consult and Referral Guidelines

Provider's initial evaluation may include:

- Asking about common symptoms seen in primary headaches
  - Tension headaches are diffuse, non-throbbing, mild-to-moderate severity headaches without significant worsening with activity, light or sound sensitivity, or nausea
  - Migraine headaches are bifrontal or unilateral moderate-to-severe intensity headaches associated with a throbbing quality, worsening with activity, associated with light and/or sound sensitivity, nausea and/or vomiting
  - Migraine aura may occur before or during headaches lasting 5-60 minutes and include sensations of visual changes (dark or bright spots or lines), sensory changes (tingling, numbness), or speech changes
- Considering other common causes of headache
  - Sinus headache
  - Post traumatic/concussive headache
  - Allergic rhinitis
  - Ophthalmologic problems
  - Depression

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Primary Headache Classification: International Classification of Headache Disorders 3rd Edition (Beta Version)

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16-year-old Female with Headache

- Frontal headache
- Throbbing quality
- "10/10"
- Needs to lay down in dark, quiet room
- Tingling left face, left arm, left leg at onset of headache for 10 min
- Occurring twice per week

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Migraine Has Two or More Major Criteria

- Bi-frontal or unilateral
- Throbbing or pounding
- Moderate to severe
- Worse with activity or relieved with rest




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Migraine Has One or More Minor Criteria

- Nausea
- Vomiting
- Photophobia
- Phonophobia




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Migraine with Aura

Migraine With Aura

A. At least two attacks fulfilling the criteria B–D (below)
B. Aura consisting of at least one of the following, but no motor weakness:
   1. Fully reversible visual symptoms, including positive features or negative features (eg, flickering lights, spots, or lines)
   2. Fully reversible sensory symptoms, including positive features (ie, pins and needles) or negative features (ie, numbness)
   3. Fully reversible dysphasic speech disturbances
C. At least two of the following:
   1. Homonymous visual symptoms or unilateral sensory symptoms
   2. At least one aura symptom develops gradually over ≥5 min or different aura symptoms occur in succession over ≥5 min
   3. Each symptom lasts ≥5 min and ≥60 min
D. Not attributable to another disorder

Table 4. Diagnostic Criteria for Basilar-type Migraine*

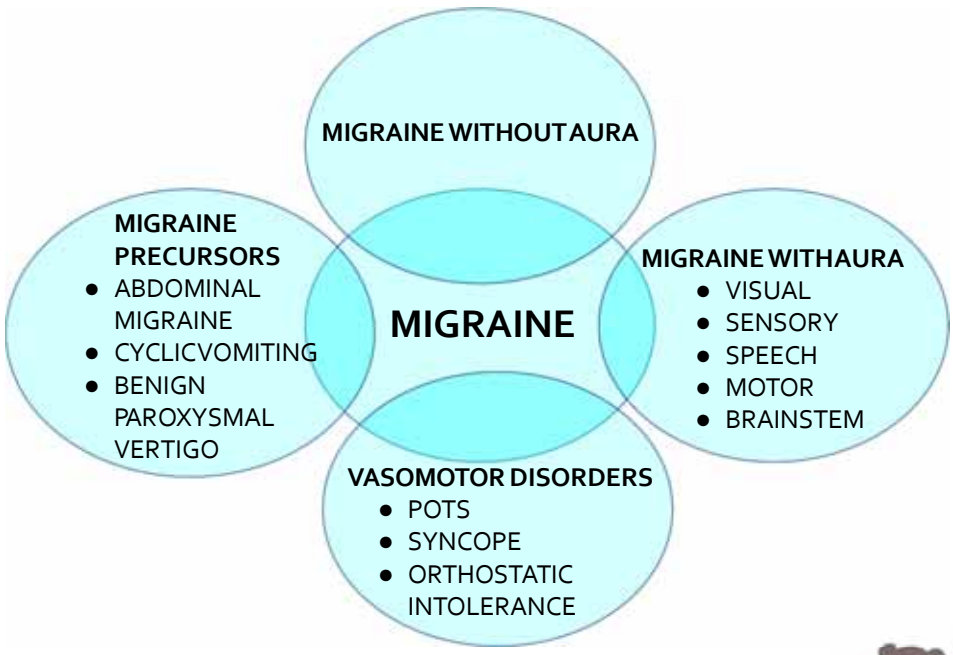
A. Fulfills criteria for migraine with aura
B. Accompanied by two or more of the following types of symptoms:
   1. Dysarthria
   2. Vertigo
   3. Tinnitus
   4. Hypacusia
   5. Diplopia
   6. Visual phenomena in both the temporal and nasal fields of both eyes
   7. Ataxia
   8. Decreased level of consciousness
   9. Decreased hearing
   10. Double vision
   11. Simultaneous bilateral paresthesias
C. At least one of the following:
   1. At least one aura symptom develops gradually over ≥5 min or different aura symptoms occur in succession over ≥5 min
   2. Each aura symptom lasts >5 and ≤60 min
D. Headache fulfills criteria for migraine without aura and begins during the aura or follows aura within 60 min

*Adapted from Olesen. (4)

Table 5. Diagnostic Criteria for Familial Hemiplegic Migraine*

A. Fulfills criteria for migraine with aura
B. Aura consists of fully reversible motor weakness and at least one of the following:
   1. Fully reversible visual symptoms, including positive features (eg, flickering lights, spots, or lines) and negative features (eg, loss of vision)
   2. Fully reversible sensory symptoms, including positive features (eg, pins and needles)
   3. Fully reversible dysphasic speech disturbance
C. At least two of the following:
   1. At least one aura symptom develops gradually over >5 min
   2. Aura symptom lasts >5 min and <24 h
   3. Headache that fulfills criteria for migraine without aura begins during the aura or follows the onset of aura within 60 min
D. At least one first-degree or second-degree relative has had an attack
E. At least one of the following:
   1. History and physical and neurologic examination findings not suggestive of any organic disorder
   2. History or physical or neurologic examination findings suggest such a disorder, but it is ruled out by appropriate investigations

Overlapping Migraine Disorders



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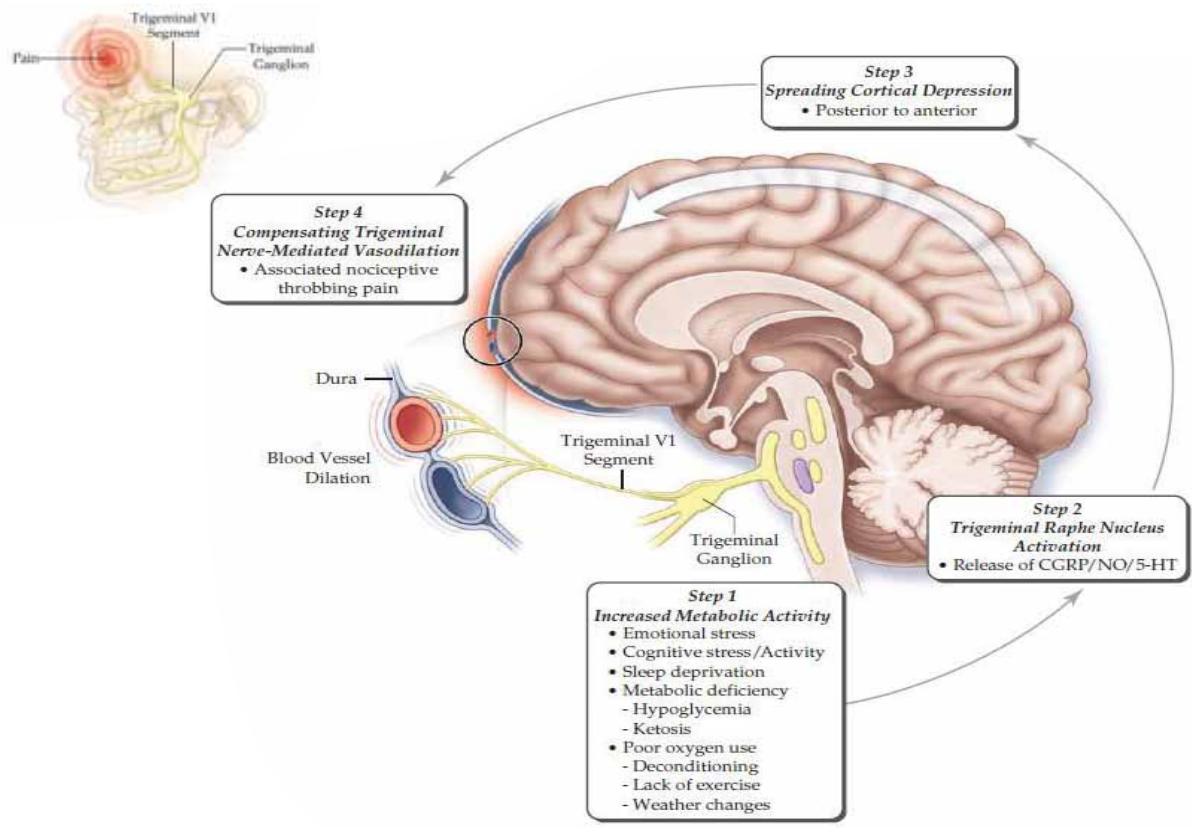
Pathophysiology of Migraine – Stress and the Trigeminovascular System



15-year-old Female with Headache

- Frontal and occipital headache
- "3/10"
- **No change with activity**
- **Dull, non pulsating**

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Tension Type Headache

- Headache lasting from 30 minutes to 7 days
- Headache has at least two of the following characteristics:
  - Bilateral location
  - Pressing/tightening (non-pulsating) quality
  - Mild or moderate intensity
  - Not aggravated by routine physical activity
- Both of the following
  - No nausea or vomiting (anorexia may occur)
  - No more than one of photophobia or phonophobia

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So Who Needs Imaging?

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Does the Patient Require Neuroimaging to Rule Out Secondary Causes of Headache?

- MRI findings in 315 children, ages 3 to 20 who had headaches
- The neurologic examinations were abnormal in 89 patients (28%).
- Thirteen (4%) had surgical space-occupying lesions
  - All had abnormal exams

Medina S, Pinter JD, Zurakowski D, et al. Children with headache: clinical predictors of surgical space-occupying lesions and the role of neuroimaging.Radiology 1997;202:819–24.

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Recommendations for MRI in Headache

Division of Child Neurology at Children's National Health System

- Headaches for less than 6 months duration not responding to lifestyle changes and first line medications
- Headaches associated with abnormal neurologic exam findings, especially papilledema, nystagmus, gait or motor changes
- Absent family history of headache
- Headaches associated with substantial confusion or emesis
- Headaches that awaken a child from sleep repeatedly
- A family history or disorders that predispose child to central nervous system lesions such as brain tumors or cerebral aneurysms

Adapted from **Medina S, Pinter JD, Zurakowski D, et al. Radiology 1997;202:819–24**

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Pediatric Headache: Consult and Referral Guidelines

Provider may consider testing in patients who:

- Patients with recurrent headache and a normal neurologic exam generally do not require additional testing
- Brain imaging studies are suggested for patients who have:
  - Headaches for less than 6 months duration not responding to lifestyle changes and standard first line treatment (ibuprofen, triptans, cyproheptadine),
  - Headaches associated with abnormal neurologic exam findings, especially papilledema, nystagmus, gait or motor changes
  - Absent family history of headache
  - Headaches associated with substantial confusion or emesis
  - Headaches that awaken a child from sleep repeatedly
  - A family history or disorders that predispose child to central nervous system lesions such as brain tumors or cerebral aneurysms
- Specific testing for children with other systemic complaints including arthralgias, rash, sleep complaints

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What Basic Treatment Should be Given for All Primary Headaches?

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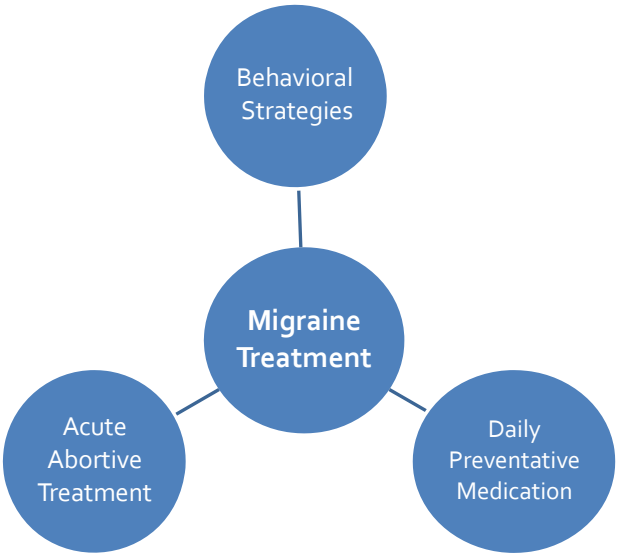
Treatment Arms in Migraine



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Headache Treatment Approach

Table 2 How to Explain Migraine and a Treatment Plan to a Patient and Family
1. Discuss the criteria for migraine and specify which are fulfilled by the child's symptoms. A standardized handout may be used for this.
2. Discuss migraine pathophysiology to explain to the child and family that increased brain needs, whether due to dehydration, sleep disruptions, poor caloric intake, barometric weather fronts, emotional stress, or increased cognitive demands, result in vasodilation to the brain, which results in activation of the V1 subdivision of the trigeminal nerve, causing head pain.
3. Discuss the treatment strategy for the patient's migraine, including separate foci on lifestyle modification, behavioral strategies, abortive therapies, and preventive therapy when indicated. A standardized handout with clear delineation of each of these areas can act as a self-administered treatment plan at home.
4. Discuss the indications for diagnostic testing and whether or not the patient fulfills these. If the patient does not require testing, discuss the historical and examination findings that are reassuring and make the likelihood of more serious central nervous system pathology unlikely.
5. Provide appropriate contact information for interim support for headaches. Consider providing a specific emergency department protocol for status migrainosus.
6. Provide specific follow-up timing.

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Comprehensive Headache Treatment Plan

Children's National | Pediatric Specialists of Virginia

My Headache Treatment Plan

Diagnoses: Migraine with aura · Migraine without aura · Chronic Migraine · Status Migrainosus · Basilar-Type Migraine · New Daily Persistent Headache · Medication Overuse Headache · POTS/Orthostatic Intolerance · Amplified Pain Syndrome · Post Concussive Headache · Tension Type Headache · Cluster Headache · Trigeminal Neuralgia

Preventative Treatment – Do these every day to prevent headaches

- ☐ Fluids -_____ ounces per day, none with caffeine or artificial sweeteners
- ☐ Exercise - 5 times a week for 30 minutes of aerobic activity (running, biking, swimming)
- ☐ Sleep - _____ hours each night, with no more than 2hrs change (do not stay up or sleep in)
- ☐ Diet - 3 healthy meals a day plus snacks if needed
- ☐ Screens – Take rest breaks with prolonged use (i.e. 10 min on, 10 min break)
- ☐ Participate - Do not avoid activities because of headache
- ☐ Distract yourself - When you have pain do something you enjoy
- ☐ Desensitize - Work through pain to teach your brain to ignore amplified pain signals
- ☐ Don't ask or talk about pain - Avoid focusing on pain and do not "check-in" about pain

☐ **Take the following medication every day to prevent headache:**

Week	# Pills AM	# Pills PM
1		
2		
3		
4		

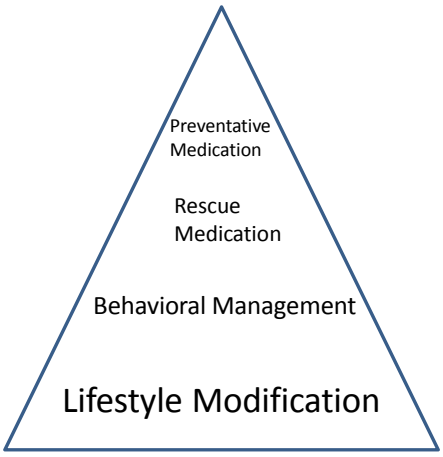
- ☐ _____ _____ mg AM _____ mg PM
- ☐ _____ _____ mg
- ☐ Riboflavin 200mg once daily for four consecutive months

Acute Treatment – Do this immediately at the first sign of headache (<1 hour from onset)

- ☐ Fluids (sports drink)_____oz. Drink quickly every time you get a headache. Avoid G2/Propel.
- ☐ _____ _____mg at headache onset. Do not take more than ___ days/week
- ☐ _____ _____ mg
- ☐ If your child has a headache longer than 3 days and the above treatment failed, go to the nearest Emergency Department for the migraine protocol on the back of this sheet.

Diagnostic Testing – Email your provider once completed to notify them the test was done for results.

- ☐ Neuroimaging MRI Brain MRV Brain MRA Brain
- ☐ Other Testing _____



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Pediatric Headache: Consult and Referral Guidelines

Provider should instruct family on basic first-line treatment for headaches including:

- Lifestyle modification for prevention of headaches including:
  - Hydration – goal ounces per day = weight in pounds to a max of 100 oz. per day, none with caffeine or artificial sweeteners
  - Exercise at least five days per week for 30 minutes
  - Sleep per AAP guidelines with no more than two hours of variability in sleep or wake timing
  - Eat three healthy well balanced meals per day

- Abortive therapy when child gets a headache includes:
  - Ibuprofen 10mg/kg per dose up to three days per week
  - 8-12 oz. fluid bolus with medication, sports drinks preferable in those without contraindications (obesity, diabetes)
  - Triptans may be considered up to twice weekly if no contraindication

- Preventative therapy may be considered in those with frequent headaches and include cyproheptadine (max 0.25mg/kg/day) and amitriptyline (max 1mg/kg QHS)

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Trial of Amitriptyline, Topiramate, and Placebo for Pediatric Migraine – CHAMP

N Engl J Med 2017; 376:115-124

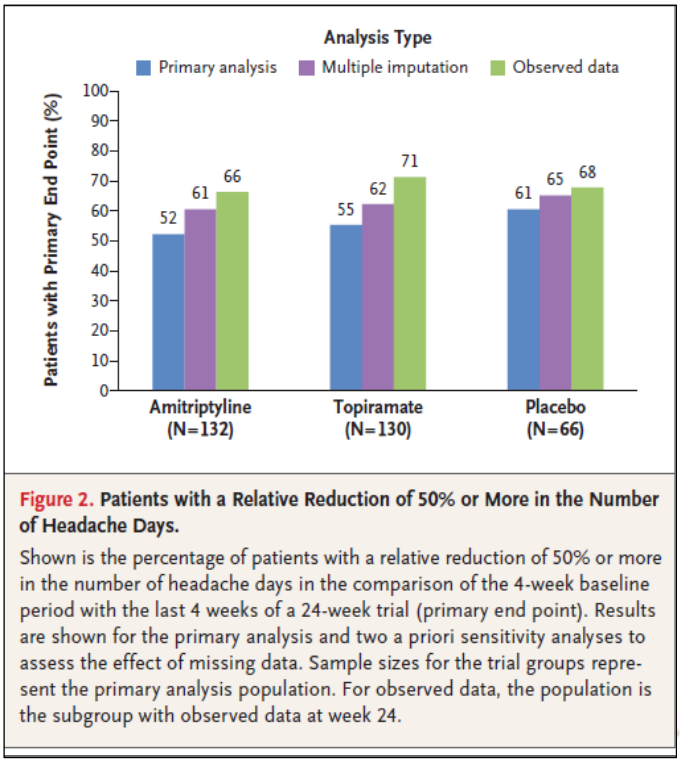
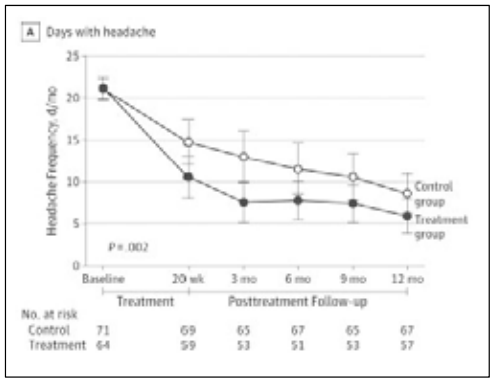


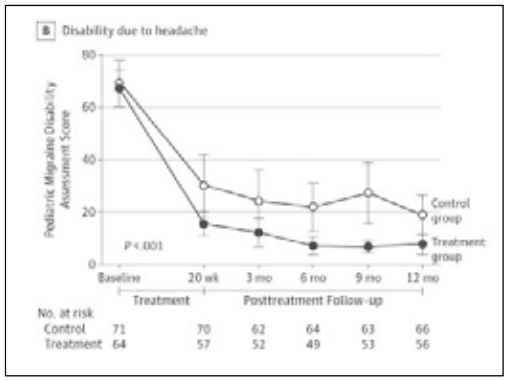
Figure 2. Patients with a Relative Reduction of 50% or More in the Number of Headache Days.

Shown is the percentage of patients with a relative reduction of 50% or more in the number of headache days in the comparison of the 4-week baseline period with the last 4 weeks of a 24-week trial (primary end point). Results are shown for the primary analysis and two a priori sensitivity analyses to assess the effect of missing data. Sample sizes for the trial groups represent the primary analysis population. For observed data, the population is the subgroup with observed data at week 24.

Cognitive Behavioral Therapy Plus Amitriptyline for Chronic Migraine in Children and Adolescents: A Randomized Clinical Trial

JAMA. 2013 December 25; 310(24): 2622–2630





- At the 20-week end point, **days with headache** were reduced by 11.5 for the CBT plus amitriptyline group vs 6.8 for the headache education plus amitriptyline group (difference, 4.7 [95% CI, 1.7–7.7] days; P = .002).
- The **PedMIDAS** decreased by 52.7 points for the CBT group vs 38.6 points for the headache education group (difference, 14.1 [95% CI, 3.3–24.9] points; P = .01).

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Pediatric Headache: Consult and Referral Guidelines

Division of Child Neurology at Children's National

Providers may consider initiating referral to child neurology when:	Providers may instruct families to bring the following to the evaluation:
•Patients with a new severe headache of acute onset, headache with focal neurologic deficit, or papilledema should be referred to the Emergency Department for neuroimaging •Recurrent headache that has been present for at least six months and is not responding to standard medical treatment including lifestyle modification and acute abortive treatment •Headache that is resulting in missed school days or worsening of school participation (declining grades, extracurricular activity limitation)	•A headache calendar for at least one month including dates of headaches, location, severity, associated symptoms, time at onset and resolution, activities preceding headaches including diet, and treatment provided •A complete list of medications used for headache treatment including doses and frequency of use. Include any abortive or preventative medications used. •Copies of testing done including other referrals, labs, imaging films/CDs (not just reports), and any other additional information that may be helpful.

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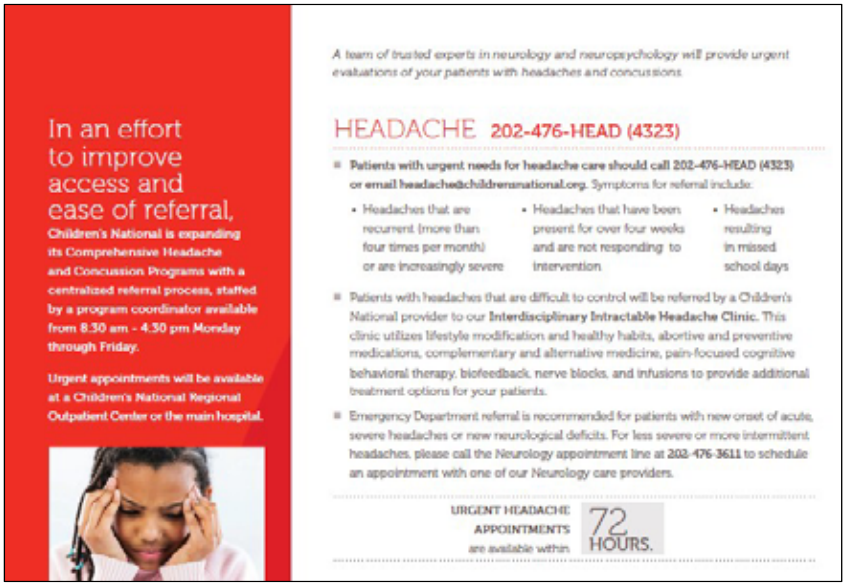
Pediatric Urgent Headache Program

Division of Child Neurology at Children's National



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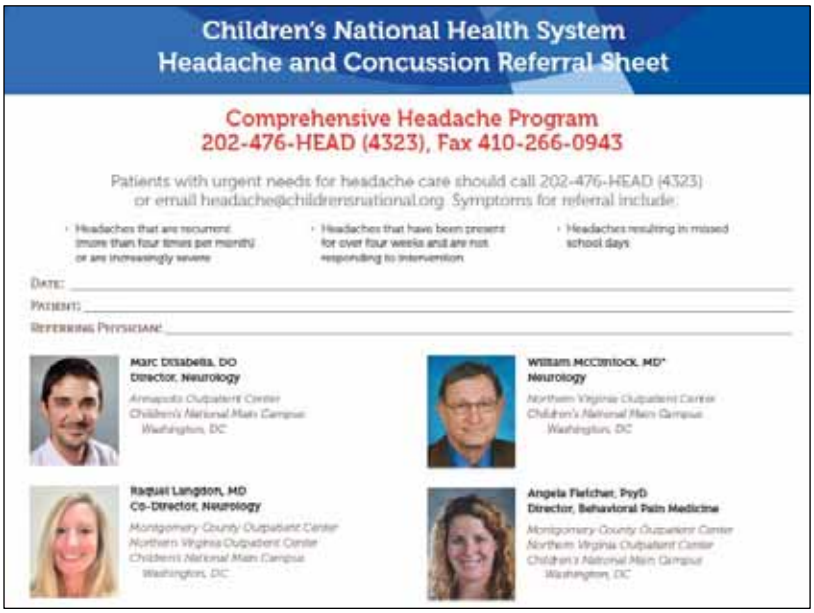
Comprehensive Interdisciplinary Headache Program

Children's National Health System



Children's National Health System
Headache and Concussion Referral Sheet

Comprehensive Headache Program
202-476-HEAD (4323), Fax 410-266-0943

Patients with urgent needs for headache care should call 202-476-HEAD (4323) or email headache@childrensnational.org. Symptoms for referral include:

- Headaches that are recurrent (more than four times per month) or are increasingly severe
- Headaches that have been present for over four weeks and are not responding to intervention
- Headaches resulting in missed school days

DATE: _____

PATIENT: _____

REFERRING PHYSICIAN: _____

Marc Dissabella, DO
Director, Neurology
Annapolis Outpatient Center
Children's National Main Campus
Washington, DC

William McClintock, MD*
Neurology
Northern Virginia Outpatient Center
Children's National Main Campus
Washington, DC

Raquel Langdon, MD
Co-Director, Neurology
Montgomery County Outpatient Center
Northern Virginia Outpatient Center
Children's National Main Campus
Washington, DC

Angela Fletcher, PsyD
Director, Behavioral Pain Medicine
Montgomery County Outpatient Center
Northern Virginia Outpatient Center
Children's National Main Campus
Washington, DC

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Complementary Therapies

Children's National Health System

Sean Alexander, MD
- Pain Medicine
- Occipital Nerve Blocks
- Trigger Point Injections

Chima Oluigbo, MD
- Neurosurgery
- Occipital nerve stimulator
- Neurointerventional Procedures

Sarah Reece, MD
- Pain Medicine
- Acupuncture

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Pediatric Headache: Consult and Referral Guidelines

Division of Child Neurology at Children's National

Provider's initial evaluation may include:	Provider should instruct family on basic first line treatment for headaches including:	Provider may consider testing in patients who:	Providers may consider initiating referral to child neurology when:	Providers may instruct families to bring the following to the evaluation:
•Asking about common symptoms seen in primary headaches: –Tension headaches are diffuse, non-throbbing, mild-to- moderate severity headaches without significant worsening with activity, light or sounds sensitivity, or nausea –Migraine headaches are bifrontal or unilateral moderate- to-severe intensity headaches associated with a throbbing quality, worsening with activity, and light or sound sensitivity, nausea and/or vomiting –Migraine aura may occur before or during headaches lasting 5-60 minutes and include sensations of visual changes (dark or bright spots or lines), sensory changes (tingling, numbness), or speech changes •Considering other common causes of headache: –Sinus headache –Post traumatic/concussive headache –Allergic rhinitis –Ophthalmologic problems –Depression	•Lifestyle modification for prevention of headaches including: –Hydration , goal ounces per day = weight in pounds to a max of 100 oz per day, none with caffeine or artificial sweeteners –Exercise at least three days per week for 30 minutes –Sleep per AAP guidelines with no more than two hours of variability in sleep or wake timing –Eat three healthy well-balanced meals per day •Abortive therapy when child gets a headache includes: –Ibuprofen 10mg/kg per dose up to three days per week –8-12oz fluid bolus with medication, sports drinks preferable in those without contraindications (obesity, diabetes) –Triptans may be considered up to twice weekly if no contraindication •Preventative therapy may be considered in those with frequent headaches and include cyproheptadine (max 0.25mg/kg/day) and amitriptyline (max 1mg/kg QHS)	•Patients with recurrent headache and a normal neurologic exam generally do not require additional testing. •Brain imaging studies are suggested for patients who have: –Headaches for less than 6 months duration not responding to lifestyle changes and first line treatment (ibuprofen, triptans, cyproheptadine), –Headaches associated with abnormal neurologic exam findings, especially papilledema, nystagmus, gait or motor changes –Absent family history of headache –Headaches associated with substantial confusion or emesis –Headaches that awaken a child from sleep repeatedly –A family history or disorders that predispose child to central nervous system lesions such as brain tumors or cerebral aneurysms •Specific testing for children with other systemic complaints including arthralgias, rash, sleep complaints	•Patients with a new severe headache of acute onset, headache with focal neurologic deficit or papilledema should be referred to the Emergency Department for neuroimaging •Recurrent headache that has been present for at least six months and is not responding to standard medical treatment including lifestyle modification and acute abortive treatment •Headache that is resulting in missed school days, worsening of school participation (declining grades, extracurricular activity limitation)	•A headache calendar for at least one month including dates of headaches, location, severity, associated symptoms, time at onset and resolution, activities preceding headaches including diet, and treatment provided •A complete list of medications used for headache treatment including doses and frequency of use. Include any abortive or preventative medications used. •Copies of testing done including other referrals, labs, imaging films/CDs (not just reports), and any other additional information that may be helpful.

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Conclusions

- Classify headache type based on standard pain questions
- Trigeminovascular system implicated in headache disorders
- Instruct all patients on healthy habits including hydration, exercise, sleep, and diet goals
- Provide every patient a rescue plan
- Cognitive Behavioral Therapy and lifestyle modification are most effective treatment
- Daily preventative medications with questionable efficacy

Children's National

Register Now for the 27th Annual Pediatric Neurology Update Movement Disorders

Wednesday, April 19, 2017
7:45 am -5 pm

This year's course will be focused on the new understandings, molecular biology, and novel treatments of childhood movement disorders ranging from Tourette's syndrome to incapacitating neuro-genetic and auto-immune conditions.

We invite you to join us for presentations from renowned experts in the field in this full-day, CME accredited event.

Learn more and register now at
ChildrensNational.org/NeurologyUpdate.

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