Pediatric Headache: A Stepwise Approach

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Disclosures

- We have no financial disclosures, but we will be discussing off label medications for pediatric headache management

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OBJECTIVES

- To give an overview of common types of pediatric headache and recognize serious secondary headache symptoms
- To identify common headache co-morbidities
- To consider imaging pathways for headache patients
- To review management of migraine and tension headache
- To discuss how to refer and when pediatric neurology can help

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Epidemiology of Pediatric Headaches
(Nieswandl et al., 2020)

- Prevalence of recurrent headache over 1 year of age
  - ~60-80%
- Migraine and Tension Type headache can occur as young as **2-3 years of age**
- 1-year Prevalence
  - 6-11 year olds = 10%
  - 12-17 year olds = 25%
  - Overall in 1 year (Migraine 27%-49%, TTH 5-13%)
- Age/Gender disparity
  - 4-7 years old: boys >girls,
  - 10 year olds and older: girls > boys

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Diagnostic Criteria for Primary Headache – Quick Screen

Migraine	Tension Type Headache
■ Disability (limits routine daily activity, work/school, social activity)	■ Bilateral location
■ Nausea	■ Pressing/tightening (non-pulsating) quality
■ Photophobia	■ Mild or moderate intensity
*At least 2 out of 3 positive → Sensitivity of 0.81 (95% CI, 0.77 to 0.85), specificity of 0.75 (95% CI, 0.64 to 0.84) in a primary care setting	■ Not aggravated by routine physical activity such as walking or climbing stairs

American Headache Society, 2020

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Migraine Criteria by ICHD-3

1. At least 5 or more attacks in lifetime
2. Headache attack lasts 4-72 hours
3. **At least 2** out of 4 features:
   1. Unilateral location
   2. Pulsating/throbbing quality
   3. moderate-severe intensity
   4. Aggravation by/causing avoidance of routine physical activity)
   5. At least 1 of the following features (nausea and/or vomiting, photophobia and phonophobia)

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"SNOOP" out Secondary Causes

History + Examination

TABLE. THE SNOOP MNEMONIC FOR SECONDARY HEADACHE DISORDER RED FLAGS

Mnemonic	History features	Physical examination features
Systemic	History of malignancy, immunosuppression, or HIV or complaints of fever, chills, night sweats, myalgias, weight loss, or jaw claudication	Abnormal systemic examination, including blood pressure and temperature
Neurologic	Focal or global neurologic symptoms, including change in behavior or personality, diplopia, transient visual obscurations, pulsatile tinnitus, motor weakness, sensory loss, or ataxia	Abnormal neurologic examination
Onset, sudden	Headache reaches peak intensity in less than 1 minute (thunderclap)	
Onset age <5 or >65	New-onset headache before age 5 years New-onset headache after age 65	
Pattern change	Progressive headache (evolution to daily headache) or change in headache characteristics	
	Precipitated by Valsalva maneuver	
	Postural aggravation	
Papilledema	n/a	Papilledema
Pregnancy	New-onset headache during pregnancy Change in headache during pregnancy	
Phenotype of rare headache	Trigeminal autonomic cephalalgia; hypnic; exercise-, cough-, or sex-induced	

Adapted from Do, T. P., Remmers, A., Schytz, H. W., Schankin, C., Nelson, S. E., Obermann, M., Hansen, J. M., Sinclair, A. J., Gantenbein, A. R., & Schoonman, G. G. (2018). Red and orange flags for secondary headaches in clinical practice: SNNOOP10 list. Neurology, 92(3), 134–144. https://doi.org/10.1212/WNL.0000000000006697

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Other Considerations

	Variant	Risk of Pathology
Medications	Growth hormone, Isotretinoin/Retinol, OCP, steroid withdrawal, tetracyclines, Bactrim	Idiopathic Intracranial Hypertension (IIH)
Medical history	Immunosuppression (HIV, Cancer)	Malignancy, cerebral vasculitis
	Obesity, HTN	IIH, Cushing's syndrome, Metabolic syndrome, OSA
	Hypercoagulable state (ie pregnancy, coagulopathy)	Cerebral sinus venous thrombosis
	Recurrent sinusitis	Abscess/Cerebral sinus venous thrombosis
	Thyroiditis, Diabetes, SLE, Crohn's/Ulcerative colitis, Sjogren's, Rheumatoid arthritis	Cerebral Vasculitis/Endocrinopathy
Menses	Absent, irregular, or excessive	Anemia
Environmental	Siblings with worsening headache, vomiting, cognition, mood changes	Carbon monoxide, lead exposure

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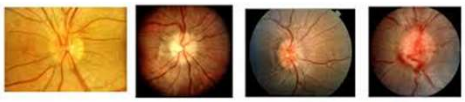
Sensitive Exam Findings

Childhood Brain Tumor Consortium (3,291 subjects)

- 94% of children with brain tumors had abnormal neurologic findings (**gait disturbance, abnormal reflexes, cranial nerve findings, and altered sensation)**
- 60% had **papilledema or increased intracranial hypertension** causing the optic nerve inside the eye to swell. **Can also cause CN VI palsy!**
- Symptoms: vision changes, positional headache, vomiting

(https://www.ncbi.nlm.nih.gov/pubmed/29724429).



Normal Optic disc | Papilledema Grade 1 | Papilledema Grade 2 | Papilledema Grade 4

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To Image or Not?

Utility of Neuroimaging in Normal Exam

- Low diagnostic yield of any findings on imaging in kids with a normal neurologic exam (3.7% -16.6%)
- All abnormalities were all incidental and did not require intervention or cause for headaches (arachnoid cyst, sinus disease, nonspecific variants)
- CT scans exposes a developing brain to radiation
- MRI takes 30-45 min of holding still in a small space and often requires sedation or general anesthesia
- Contrast dye accumulates in the brain and we don't know if that is dangerous or not *(order MRI without contrast unless fear of infection)*
- There is a 10% chance of uncovering an incidental cyst or spot in brain *(warn parent ahead of time about cysts and normal variants)*

Lewis, D. & Dorbad, D. (2000).

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National Recommendations

ACR American College of Radiology — Quality is Our Image

American Headache Society

- **MRI examination usually be more revealing** than other modalities and is preferred imaging
- CT is usually not the study of choice **aside from acute concern for intracranial bleed or brain tumor**
- There is **no necessity** to do neuroimaging in patients with **headaches consistent with migraine** with a **normal neurologic examination** and **no atypical features or red flags**

Lewis, D. & Dorbad, D. (2000).

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Insurance Criteria for MRI

- Abnormal Neurological Exam
- Sudden, severe (max within 1 min)
- Positional/postural headache
- Provoked by cough, exertion, strain
- Awakens child from sleep
- Marked change in pattern/symptoms
- History of pregnancy, neurocutaneous d/o, malignancy, immunosuppression
- Initial evaluation of trigeminal autonomic cephalalgia (hemicrania with unilateral autonomic symptoms)
- Initial for hemiplegic, brainstem migraine
- Unresponsive to medical management

AIM SpecialtyHealth

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What Imaging Should I Order?

2018 ACR Appropriateness Criteria

Variant 2. Child. Secondary headache. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRI head without IV contrast	Usually Appropriate	O
MRI head without and with IV contrast	Usually Appropriate	O
CT head without IV contrast	May Be Appropriate	☢☢☢
MR venography head without IV contrast	May Be Appropriate	O
MRA head without IV contrast	May Be Appropriate	O
CT venography head with IV contrast	May Be Appropriate	☢☢☢☢
CTA head with IV contrast	May Be Appropriate	☢☢☢☢
MR venography head with IV contrast	Usually Not Appropriate	O
Arteriography cerebral	Usually Not Appropriate	☢☢☢☢
CT head with IV contrast	Usually Not Appropriate	☢☢☢
CT head without and with IV contrast	Usually Not Appropriate	☢☢☢☢
X-ray skull	Usually Not Appropriate	☢☢

CTA = CT angiography; IV = intravenous; MRA = MR angiography.

Variant 3. Child. Sudden severe headache (thunderclap headache). Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
CT head without IV contrast	Usually Appropriate	☢☢☢
MRA head without IV contrast	Usually Appropriate	O
MRI head without IV contrast	Usually Appropriate	O
CTA head with IV contrast	May Be Appropriate	☢☢☢☢
CT head with IV contrast	Usually Not Appropriate	☢☢☢

(Hayes, et al., 2018)

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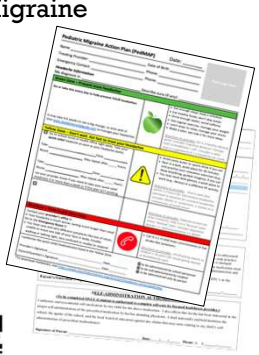
Acute Treatment for Migraine

- **Pearls for Acute Treatment**
  - Treat early, not often
  - Start while headache is still small
  - Use a full dose of appropriate medicine (NSAID or Triptan)
  - Add an oral fluid bolus if not nauseated
  - Add an anti-emetic if nauseated
  - Be sure child has permission to take meds at school (PPA/PedMAP)



Turner et al., *Headache* 59(10), Nov 2019. 1871-1873.

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Headache Healthy Habits for First-Line Prevention of Migraine

American Headache Society

Sleep	Keep a regular bedtime routine with consistent sleep times (even on weekends) • Limit naps • Avoid screen time 1-2 hours before bedtime • Aim for 9-11 hours of sleep each night **If you have difficulty falling asleep, ask your parents to talk to your doctor about melatonin.*
Meals (Nutrition and Hydration)	• Eat consistent meals and don't skip meals (especially breakfast) • Snack as needed • Aim to drink half your bodyweight (in pounds) in ounces of water • Bring a water bottle to school to ensure consistent hydration throughout the day • Dilute any high sugar electrolyte drink with water
Activity	• Limit screen time to 2 hours or less per day • Aim for at least 30 minutes of physical activity 3-5 days per week. Your heart rate should be raised. **You may increase duration and intensity of exercise as tolerated.*
Relaxation	• Use relaxation training and biofeedback programs that reduce stress and/or anxiety. These include mindfulness apps, deep breathing techniques and yoga. • Practice counter-stimulation using a strong (more tolerable) stimulus during a migraine attack to distract from pain and break pain cycle. For example, use a cold ice pack on your forehead or the back of your neck, or put a strong mint or sour candy on your tongue.
Triggers	• Recognize and eliminate triggers including dietary, environmental, medical, physical and behavioral. For example, specific foods, irregular meals, odors, weather changes, stress, poor sleep habits, etc. • Keep a headache log to identify triggers and track response to the above factors.

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American Academy of Neurology (AAN) Practice Guidelines

Medication	Dosing	Frequency
Ibuprofen/Motrin (OTC)	10mg/kg/dose (max 800mg)	May repeat in 6 hours; 3 treatment days/week
Acetaminophen (OTC)	10-15mg/kg/dose (max 1000mg)	May repeat in 4 hours; 3 treatment days/week
Naproxen (OTC) Option Treximet (Imitrex+Naproxen)	5-7mg/kg (max 500mg)	May repeat in 8 hours; 3 treatment days/week
Sumatriptan (Imitrex) 12yo+ *see contraindications	>12yo: 25mg-50mg	May repeat in 2 hours; 2 doses in 24 hours, 2 treatment days/week
Rizatriptan (Maxalt) 6yo+ *see contraindications	5-10mg <40kg 10-20mg >40kg	May repeat in 2 hours; 2 doses in 24 hours, 2 treatment days/week
Antiemetics/Anti-dopanergic • Zofran • Phenergan • Oral Compazine	See referencing	Typically only used at onset or as needed for nausea/emesis

- Choose 1 or 2 agents with clear instructions/written plan
- Ensure weight appropriate and timed with headache onset
- Provide appropriate school medication form
- **Avoid Barbiturates/Opioids/Excedrin Migraine/Caffeine**
- ***Triptans contraindicated with hemiplegic/basilar migraine or prolonged aura, stroke, WPW***

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Prescribing Considerations

Estrogen-based oral contraceptives are contraindicated in women with migraine with aura >35 yo. (<35 if smoke or other stroke-related risk factors)

Triptans vasoconstrict small cerebral vessels with higher risk for ischemic stroke in migraine with complicated aura or concomitant risk factors such as smoking, estrogen-based OCP, sickle cell, pregnancy.

American Headache Society & WHO

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AAN Practice Guidelines

Chronic Treatment *(August 2019)*

- Headache more than 6 days in a month is a **risk factor for chronic migraine and medication overuse**
- **Topiramate** is the only FDA-approved medication for migraine prevention (in children and adolescents aged 12 to 17 years)
- However, the majority of randomized, controlled trials studying the efficacy of preventive medications for pediatric migraine failed to demonstrate superiority to placebo (includes Amitriptyline and Topiramate and Propranolol)
- **Amitriptyline**: black box warning - risk of suicidal thoughts and behavior within pediatric population
- **Topiramate/Depakote**: Counseling for teratogenic effects
- **Cyproheptadine**: rarely effective in > 5-6 year olds for headache alone due to dosing needs. Side effects: significant sedation and weight gain

https://www.aan.com/Guidelines/home/GetGuidelineContent/971

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Headache Relief Guide

Promoting Autonomous Care

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Linking Emotional Stress and Chronic Pain

- 2010 study isolated 8 variables – Each group demonstrated a significant increase in chronic headache as an adult compared to control
  - emotional, physical, or sexual abuse
  - witnessing domestic violence
  - growing up with mental illness in the home
  - having household members who were incarcerated or were abusing drugs
  - experiencing parental separation or divorce
- Additional studies show pediatric migraine patients have higher incidence of:
  - Attention deficit hyperactivity disorder or Learning disability
  - Anxiety
  - Depression/SI
  - Tourette syndrome
  - Obesity/sleep disorders

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Screening for stressors and safety

Consider for persistent or chronic cases

- **Mood/Mental health/Social**
  - Focus/impulsivity symptoms
  - Learning disability
  - Anxiety/compulsion
  - Past childhood trauma, abuse, neglect
  - Depression or suicidal thoughts
- **School** *(Failing grades, new school, Lost IEP, Bullying)*
- **Home** (*Divorce, Domestic violence, Death/illness, Advanced responsibilities*)
- **Work/Sports** (*Overscheduled, High pressure)*

Counseling vs. Pain Cognitive Behavioral Therapy:

CBT works in 30%-60% of Migraineurs. It is an evidenced-based, well-defined, outcome-driven series of sessions teaching techniques that modify the way child manages both triggers and pain itself.

- Progressive relaxation
- Biofeedback
- Guided imagery
- Deep breathing
- Behavioral modifications

https://www.psychologytoday.com/us/therapists/cognitive-behavioral-cbt/alabama

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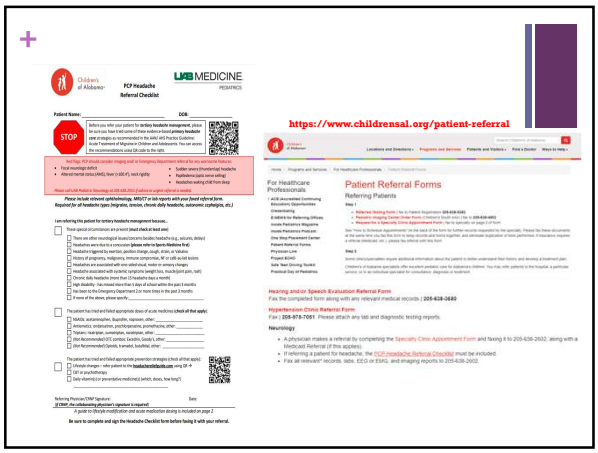
PCP Headache
Referral Checklist
https://www.childrensal.org/patient-referral
Patient Referral Forms
Referring Patients

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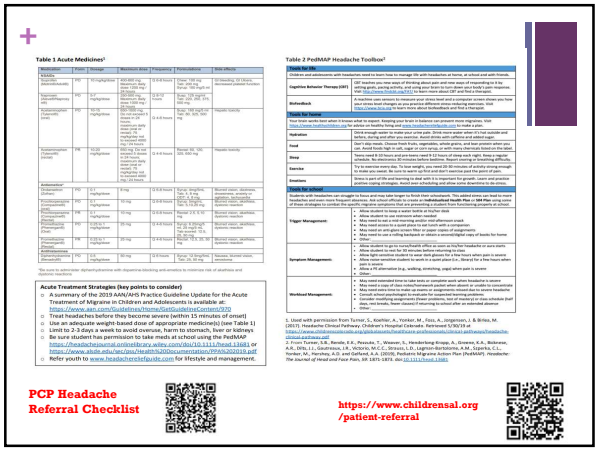
Table 1 Acute Medicines
Table 2 PedMAP Headache Toolbox
Acute Treatment Strategies (key points to consider)
PCP Headache
Referral Checklist
https://www.childrensal.org
/patient-referral

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Example of 504 plan for Migraine

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Summary

- Headaches in kids are common with prevalence 27%-49%
- A practitioner's first step is to screen for red flags (can use SNOOPY) in both history and exam and utilize ER if emergent concerns
- Consider risk vs benefits of imaging
- Counsel family on acute treatment priorities, medication, & healthy habits
- Provide school support by way of medication plan and school forms
- Encouraged autonomous care through resources and Migraine Relief Guide
- Consider use of daily preventative option for high frequency, chronic headache but important to counsel on studies with high placebo effect
- For more difficult cases, consider co-morbidities of learning problems, ADHD, Mood, Sleep disorders or other social risk factors

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Questions?

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