PEDIATRIC HEADACHE DIAGNOSIS, TREATMENT and REFERRAL GUIDELINES

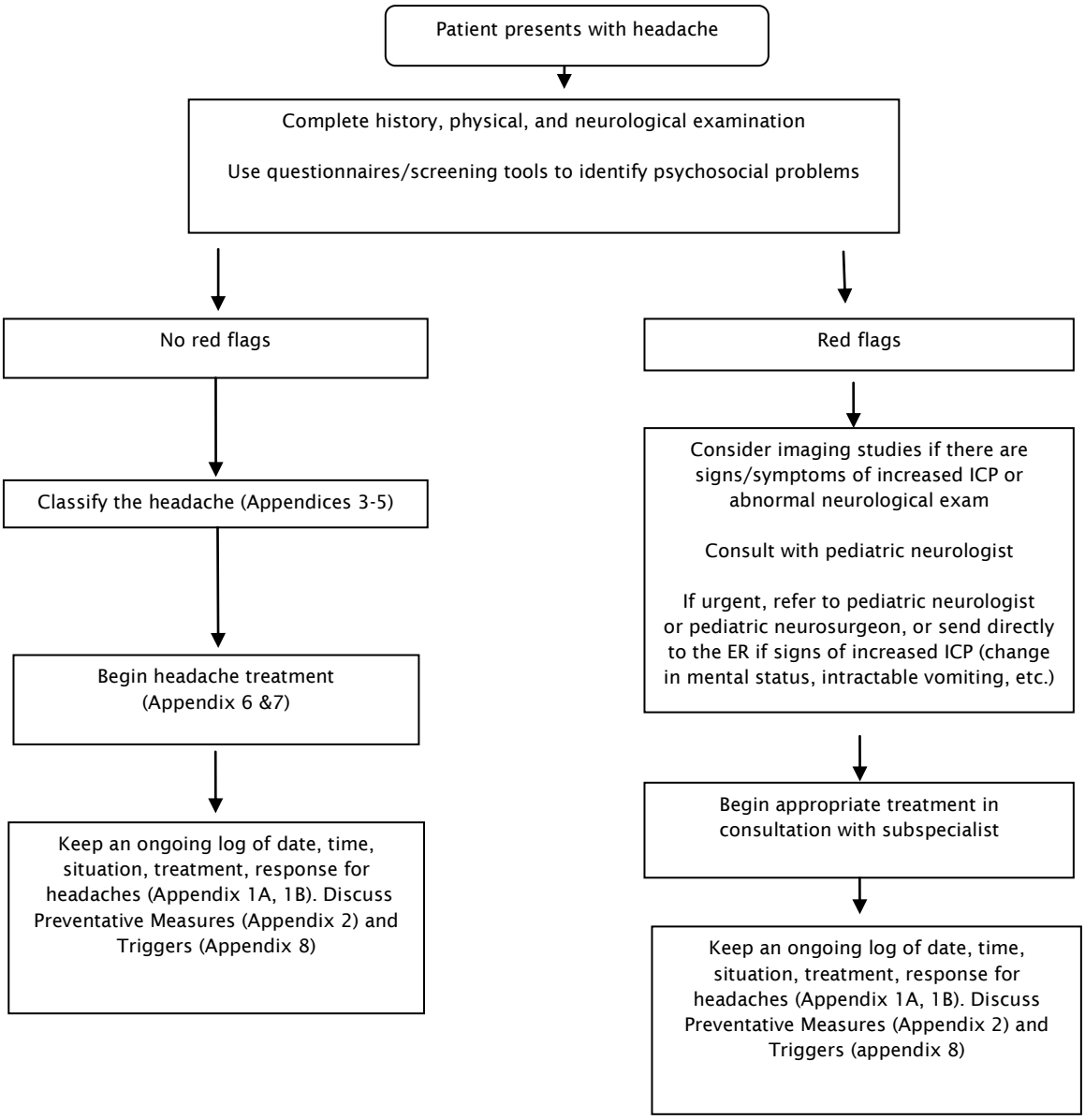
For use in 3-21 years of age

Developed in collaboration with Phoenix Children's Hospital Department of Pediatric Neurology, Children's Health Accountable Care Collaborative of North Carolina, and the Arizona Chapter of the American Academy of Pediatrics (AZAAP)

Disclaimer

This guideline is not intended to replace clinical judgment. It is meant to assist licensed independent practitioners and other health care providers in clinical decision-making by describing a range of generally acceptable approaches to the diagnosis and management of a particular condition. A particular patient's circumstances should always be taken into account when a practitioner is deciding on a course of management.

Pediatric Headache Algorithm



History

- Important to talk with parent and child about the problem; use open-ended questions
- Type of pain
- Location of pain
- Daily timing of the pain
- Duration of episodes
- Chronicity of the problem
- Sleep disturbances
- Headache triggers: foods, environmental factors, situations
- Psychosocial factors:

  - patient-parent relationship,
  - alcohol/drug/tobacco use,
  - stressors,
  - bullying,
  - learning disability,
  - school problems,
  - parental discord,
  - chronic family illnesses,
  - boyfriend/girlfriend problems

Red Flags: History

- Worst headache of their life
- First thing in the morning, positional headaches, especially with vomiting
- During sleep, especially with vomiting
- Occipital location
- Atypical or change in pattern (without obvious stressors)
- Accelerating course (increasing frequency or increasing severity)
- Recurrent severe headache(s) unresponsive to treatment
- Triggered by exertion, particularly in post-pubertal children
- Headaches associated with neurological deficits
- Confusion, impaired consciousness
- Sudden, complete loss of vision
- Diplopia
- Focal weakness
- New onset of seizures
- Personality changes
- Abrupt decline in school performance
- Paresthesias, tingling

Physical Examination*

- Blood pressure
- Temperature
- Review growth chart – (any sudden changes)
- Pubertal assessment
- Skin - Cutaneous abnormalities (r/o Tuberous sclerosis and neurofibromatosis)
- Head and neck- sinus, thyroid, skull, cervical spine, ears
- Eyes – fundoscopic, movement
- Nose and throat inspection
- Temporomandibular joints and teeth
- Mental Status
- Cranial nerves – brain stem
- Motor and sensory exam – ascending and descending pathways
- Deep tendon reflexes/strength
- Tandem (heel-to-toe) gait
- Pronator drift on Romberg (stand with eyes closed, put hands out with palms up and observe for unsteadiness, hand drift to prone position)

Red Flags: Physical Examination

- Signs of increased intracranial pressure
  - Large or accelerating head circumference (infants and toddlers)
  - Papilledema
  - Cranial nerve VI palsy (Limited abduction, esotropia, double vision)
- Meningeal signs
- Fever, rigors
- Evidence of recent head trauma
- Altered mental status
- Neurocutaneous findings
- Focal Neurological signs (e.g., brainstem or cerebellar signs like ocular paralysis, nystagmus and other cranial nerve abnormalities, ataxia or hemiplegia)

Radiologic Evaluation

MRI without contrast unless imaging study needed urgently, then do CT without contrast*

- Suspected primary headache - appropriate in migraine complicated by focal neurological symptoms or signs, or concerning change in frequency or severity
- Headache with signs of increased intracranial pressure (ICP) or abnormal neurological signs
- Severe headache of abrupt onset (thunderclap headache) - CT preferred*
- Headache attributed to infection - CT prior to LP*
- Headache attributed to recent trauma - CT preferred*
- Occipital headache - MRI preferred due to limitation of CT to view posterior fossa (e.g. Arnold Chiari Malformation)

* CT can be obtained urgently in most communities and can give adequate information to identify intracranial bleeding or increased ventricular size. However, if MRI is available, this would be preferred to minimize radiation and improve diagnosis.

** Imaging is not necessary for migraines without aura or for migraines with typical aura

Referral

Reasons for Referral/Consultation*

- Red Flags in the History
- Red Flags in the Physical Exam
- Red Flags in the Neurological Exam
- Significant Abnormality on Radiologic Evaluation

**** Send all pertinent labs, radiographic evaluations (CDs of actual studies), list of medications and a 2 month patient calendar of the child's headaches (dates, times, duration, associated symptoms, treatments). *See appendix 1A & 1B**

Questionnaires / Screening Tools that can be used to further assess psychosocial issues

- Anxiety - SCARED (Child)
  http://www.psychiatry.pitt.edu/sites/default/files/Documents/assessments/SCARED%20Child.pdf

- Anxiety – SCARED (Parent)
  http://www.psychiatry.pitt.edu/sites/default/files/Documents/assessments/SCARED%20Parent.pdf

- ACE – Adverse Childhood Experience
  http://www.theannainstitute.org/Finding%20Your%20ACE%20Score.pdf

- Depression – PHQ-9
  http://www.integration.samhsa.gov/images/res/PHQ%20-%20Questions.pdf

- PedMIDAS (Migraine disability tool)
  www.cincinnatichildrens.org/service/h/headache-center/pedmidas/

- Pediatric Symptom List
  http://brightfutures.org/mentalhealth/pdf/professionals/ped_sympton_chklst.pdf

Headache diary smartphone apps

- iHeadache (*iPhone)*
  www.iheadache.com

- Migraine Buddy (*Android*)
  www.migrainebuddy.com

Treatment

Rescue

- Ibuprofen; diphenhydramine; promethazine; prochlorperazine; triptans; caffeinated beverage; extra water. (See Appendices 6 for medications and dosages)
- Ondansetron may be used in addition if there is persistent nausea

Prevention (when headaches occur once or twice a week or more) (*See appendix 2)

- Hydration → goal in ounces per day = weight (lbs) to a max of 100 oz/day (NONE with caffeine or artificial sweeteners)
- Night time sleep duration should be 10 to 12 hours for elementary school children and 8 to 10 hours for teenagers, with no more than 2 hours of variability in sleep or wake pattern on weekends (AAP guidelines)
- Eat regular meals – Do not skip meals
- Recognize trigger foods such as caffeine, cheddar cheese, chocolate, red meat, dairy products, vinegar, bacon, hotdogs, pepperoni, bologna, deli meats, smoked fish, sausages. Food with MSG=dry roasted nuts, Chinese food, soy sauce
- Recognize other triggers: over-exertion, stress, loud noise, intense emotion/anger, excitement, weather changes, strong odors, secondhand smoke, chemical fumes, motion or travel, medication, hormone changes & monthly cycles
- Relaxation training, such as yoga or meditation
- Behavioral therapy and biofeedback
- Avoid overuse of over-the-counter medications (acetaminophen, ibuprofen, or naproxen) as they may produce rebound or medication overuse headaches – limit to 3 days per week or less
- Consider daily prescription or over the counter medication supplements for prevention (Appendix 7)
    - If headaches occur 4-8 days a month or more
    - High disability from headaches (based on the PedMIDAS disability tool)
    - No or poor response to multiple abortive therapies

Follow Up

Schedule a follow-up appointment in 2-4 weeks to review headache log, evaluate possible psychosocial factors, and revise treatment plan as needed.

Appendices

Appendix 1A. Weekly Headaches Diary (Chronic)
Appendix 1B. Episodic Headache Diary
Appendix 2. Headache Prevention Tips
Appendix 3. Headache Classification
Appendix 4. Diagnostic Criteria for Migraine
Appendix 5. Criteria for Tension and Chronic Tension type Headaches
Appendix 6. Headache Medication – Outpatient Rescue Treatments
Appendix 7. Headache Medication- Preventative, OTC supplements, Inpatient, ER Treatments
Appendix 8. Headache Triggers

Appendix 1A

CHRONIC HEADACHE DIARY

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Dates							
Prodrome							
Aura							
Time of pain onset							
Severity of pain							
Treatment 1 (dose)							
Symptoms (nausea, throbbing, disability)							
Treatment 2 (dose)							
Treatment 3 (dose)							
Time to pain relief							
Noted triggers (caffeine, menses, etc.)							
Type of headache (migraine, tension)							
Other comments or questions							

**Provided by PCH Department of Pediatric Neurology. This may be copied and/or given as a handout to parents or patients

Appendix 1B

EPISODIC HEADACHE DIARY

Dates							
Prodrome							
Aura							
Time of pain onset							
Severity of pain							
Treatment 1 (dose)							
Symptoms (nausea, throbbing, disability)							
Treatment 2 (dose)							
Treatment 3 (dose)							
Time to pain relief							
Noted triggers (caffeine, menses, etc.)							
Type of headache (migraine, tension)							
Other comments or questions							

**Provided by PCH Department of Pediatric Neurology. This may be copied and/or given as a handout to parents or patients

Appendix 2

Headache Prevention Tips

Headache may be triggered or worsen with certain types of foods, activities, medications, or stress. Below is a list of possible ways to make a few modifications to your lifestyle that may significantly impact the frequency of headaches

Get Regular Sleep	• Go to bed and wake up at regular times each day • Do not sleep excessively on the weekends and too little on the weekdays • Most children need between 8 to 12 hours of sleep per night
Eat Regular Meals	• Low blood sugar can trigger a headache • Eat regular meals three times each day including protein, fruits, vegetables and carbohydrates • Too much sugar may lead to a rapid increase in blood sugar followed by a rapid decline in blood sugar, which can trigger a headache
Get Moderate Amounts of Routine Exercise	• Moderate exercise three to five times each week will help reduce stress and keep you physically fit • Too much exercise or inconsistent patterns of exercise may trigger headache
Drink Plenty of Water	• A normal child should drink plenty of water during the day (ounces = weight in pounds) • Dehydration may cause headaches
Limit Caffeine, Alcohol and other Drugs	• Caffeine is a stimulant and caffeine withdrawal may cause headaches when blood levels of caffeine taper • Alcohol and drugs may be a trigger for headaches
Reduce Stress	• Stress may lead to an increase in headache • Relaxation and stress management may help reduce headaches

Developed by The American Headache Society (http://www.achenet.org/resources/trigger_avoidance_information/)

It can be copied to handout to parents and/ or patients

Appendix 3. Headache Classification

Primary headaches	
Tension headache	▪ Tension type ▪ Chronic Tension type
Migraine headaches	
	▪ Migraine without aura ▪ Menstrual migraine ▪ Migraine with aura ▪ Migraine with brainstem aura ▪ Hemiplegic migraine - familial and sporadic ▪ Primary stabbing headache ▪ Retinal migraine ▪ Abdominal migraine ▪ Migraine equivalents - Benign paroxysmal torticollis and paroxysmal vertigo
Secondary headaches	
Trauma	▪ Post-traumatic ▪ Intracranial hemorrhage
Tumors Arnold Chiari Malformation	
Increased intracranial pressure	▪ Hydrocephalus ▪ Pseudotumor cerebri
Decreased intracranial pressure	▪ Dural puncture ▪ Traumatic dura leak ▪ Spontaneous dura leak
Sinus headaches	▪ Sinusitis, allergic rhinitis
Temporo-mandibular joint	
Dental abnormalities	▪ Dental abscess, wisdom teeth
Ocular abnormalities	▪ Glaucoma
Systemic illness	▪ Infectious- especially meningoencephalitis ▪ Autoimmune ▪ Renal abnormalities ▪ Hepatic abnormalities ▪ Metabolic- mitochondrial disorders

Vascular disorders	▪ Arteriovenous malformations ▪ Aneurysms ▪ Other causes of intracranial hemorrhage ▪ Cerebral Venous Thrombosis (CVT) related to oral contraceptives, chemotherapeutics, increased clotting tendency, rheumatologic conditions
Medications	▪ Stimulants ▪ SSRI ▪ Antihypertensives
Substance abuse	▪ Alcohol ▪ Marijuana ▪ Opiates and other drugs
Epilepsy and seizures	
Affective disorders/ Psychosocial	▪ Depression ▪ Anxiety disorder

Appendix 4. Diagnostic Criteria for Migraine

Migraine without aura

A. At least 5 attacks fulfilling criteria B through D below

B. Headache attacks lasting 2 to 72 hours (untreated or unsuccessfully treated) - When the patient falls asleep during a migraine attack and wakes up without it, duration of the attack is reckoned until the time of awakening

C. Headache has at least 2 of the following characteristics:

- Unilateral location (often bilateral in children under 18 years)
- Pulsating quality
- Moderate or severe pain intensity
- Aggravation by or causing avoidance of routine physical activity (e.g., walking or climbing stairs)

D. During headache at least 1 of the following:

- Nausea, vomiting, or both
- Photophobia and phonophobia (can be inferred from behavior in young children)

E. Not better accounted for by another ICHD-3 diagnosis

Migraine with aura

A. At least 2 attacks fulfilling criteria B and C below

B. One or more of the following fully reversible aura symptoms:

- Visual
- Sensory
- Speech and/or language
- Motor
- Brainstem
- Retinal

C. At least 2 of the following 4 characteristics:

- At least 1 aura symptom spreads gradually over ≥5 minutes, and/or 2 or more symptoms occur in succession
- Each individual aura symptom lasts 5 to 60 minutes
- At least 1 aura symptom is unilateral
- The aura is accompanied, or followed within 60 minutes, by headache

D. Not better accounted for by another ICHD-3 diagnosis, and transient ischemic attack has been excluded

Migraine with typical aura

A. At least 2 attacks fulfilling criteria B through D below

B. Aura consisting of visual, sensory and/or speech/language symptoms, each fully reversible, but NO motor, brainstem or retinal symptoms

C. At least 2 of the following 4 characteristics:

- At least 1 aura symptom spreads gradually over ≥5 minutes, and/or 2 or more symptoms occur in succession

- Each individual aura symptom lasts 5 to 60 minutes
- At least 1 aura symptom is unilateral
- The aura is accompanied, or followed within 60 minutes, by headache

D. Not better accounted for by another ICHD-3 diagnosis, and transient ischemic attack has been excluded

---

Appendix 5. Criteria for Tension and Chronic Tension-type Headaches*

Tension headaches	▪ Lasting 30 minutes to 7 days ▪ At least 2 of the following: o Bilateral location o Pressing/tightening (non-throbbing) quality o Mild or moderate intensity o Not aggravated by routine physical activity
Chronic tension type headache	▪ Occurring for 15 or more days/month for 3 or more consecutive months ▪ Lasting hours to days, or unremitting

* Does NOT include migraine symptoms (nausea, vomiting, light/sound sensitivity)

Abbreviations: ICHD-3 Beta, International Classification of Headache Disorders-3
Source: The International Classification of Headache Disorders, 3rd edition (beta version). *Cephalalgia*. 2013; 33(9):629-808.
http://www.ihs-classification.org/_downloads/mixed/International-Headache-Classification-III-ICHD-III-2013-Beta.pdf

OUTPATIENT RESCUE TREATMENT OPTIONS (important to take rescue medication as soon as possible after onset of headache)

Appendix 6:

MEDICATION	DOSAGE	AGE	SIDE EFFECTS	MISCELLANEOUS
Ibuprofen (Advil, Motrin)	10/mg/kg/dose.	3-21 yrs	nausea, ulcer	Max 40 mg/ kg/day
Acetaminophen (Tylenol)	15 mg/kg/dose	3-21 yrs	nausea	Max 1 gm/dose
Naproxen (Aleve)	5-7 mg/kg/dose		nausea , ulcer	Max 1000 mg
Diclofenac Sodium (Cambia)	2-3mg/kg/day divided 2-4 times/day (Cambia= 50 mg pkt)		ulcer, GI bleed	Max 200 mg/ day
Sumatriptan (Imitrex)	25, 50, 100mg, can repeat in 2 hrs		hot/ cold feeling, malaise	Max 200 mg/ day
Sumatriptan intranasal	20-39kg= 5 mg, 10mg, >40 kg=20 mg, can repeat in 2 hrs		hot/ cold feeling, malaise	Max 40 mg/ day
Sumatriptan SQ	4-6 mg single dose(0.06/mg/kg/dose)		Injection site rxn	Max 12mg/ day
Rizatriptan (Maxalt)	<40 kg = 5 mg, >40 = 10 mg, can repeat in 2 hrs	FDA approved 6-17 yrs	dizzy, malaise, nausea	standard oral tablets and ODT, Max 20 mg/day Contraindicated <40kg if taking propranolol
Zolmitriptan (Zomig)	2.5, 5 mg, can repeat in 2 hrs	nasal FDA approved 12-17 yrs	dizzy, malaise, nausea	standard oral tablets and nasal spray, Max 10mg/day
Almotriptan (Axert)	6.5, 12.5 mg, can repeat in 2 hrs	FDA approved 12-17 yrs	dizzy, malaise, nausea	Max 25 mg/ day
Sumatriptan/Naproxen (Treximet)	10/60 mg, 85/500 mg at onset of migraine, can repeat in > 2hrs	10/60 mg FDA approved 12-17 yrs	dizzy, malaise, nausea, GI	Max 2 tabs /day
Intranasal DHE (Migranal)	0.5/spray, 1 spray in each nostril, can repeat in 15 min		dizzy, malaise, nausea	Can premedicate with antiemetic Do NOT combine with a Triptan, Max 4 sprays/attack
Ketorolac (Toradol)	10 mg PO every 4-6 hrs		HA, nausea, SA, dyspepsia	Max 40 mg/ day
Promethazine(Phenergan)	0.25-0.5 mg/ kg/ dose		Extrapyramidal sx's; sedation, dizzy, confusion	Max 25mg/dose or 75 mg/day Give Benadryl to reverse dystonic reaction
Prochlorperazine(Compazine)	2.5-5 mg/dose every 8 hours,		Extrapyramidal sx's; sedation, dizzy, confusion	max 10-15 mg/day based on weight Give Benadryl to reverse dystonic reaction
Ondansetron (Zofran)	<12 yrs= 0.15 mg/kg, max 4 mg q8hrs, >12 yrs = max 8mg 8hrs		HA, constipation, fatigue	standard oral tablets and disintegrating tablets
Metoclopramide (Reglan)	0.1-0.2 mg/kg/dose every 6 hours		Extrapyramidal sx's sedation, dizzy, confusion	Max 0.8mg/kg/day Give Benadryl to reverse dystonic reaction

Other triptan medications: Eletriptan (Relpax), Naratriptan (Amerge), Frovatriptan (Frova)

**** Triptans contraindicated in certain cardiac /vascular disorders ****

*MANY OF THESE MEDICATIONS ARE OFF-LABEL TREATMENTS FOR CHILDREN. FDA-APPROVED MEDICATIONS ARE NOTED ABOVE.
**THESE ARE GUIDELINES AND PROVIDERS ARE FULLY RESPONSIBLE FOR THE CORRECT DOSAGES, AGES AND SIDE EFFECTS WHEN PRESCRIBING

Appendix 7: PREVENTATIVE MEDICATIONS (ALLOW 1-2 MONTHS TO IMPROVE, START LOW & TITRATE)

Propranolol (Inderal)	0.5-4 mg/kg/day divided TID, Max 120 mg/day		fatigue, dizzy, constipation	Contraindicated with asthma
Amitriptyline (Elavil), Nortriptyline (Pamelor)	0.25- 1 mg/kg/dose at bedtime, Max 2mg/kg or 75 mg/ day		Drowsy (dose at night), dizzy, constipation,mood change	If >25mg/ day then monitor cardiac status /EKG
Cyproheptadine (Periactin)	2-8 mg/dose at bedtime, Max 0.5 mg/kg/day or 16 mg/day		Drowsy (dose at night), nausea, wt gain, SA	Usually use in children 12 yrs and younger
Divalproex (Depakote)	10-30 mg/kg/day divided BID, Max 1000mg/ day		HA,nausea,sedation,dizzy	Avoid in females 11 yrs and older Monitor CBC and LFTs
Topiramate (Topamax)	1-3 mg/kg/day, Max 200 mg/day	FDA approved 12-17 yrs	Dizzy, nausea, parasthesia, anorexia, wt loss, kidney stones	Divide BID if giving 50 mg/day or more

OTC SUPPLEMENTS THAT CAN BE TRIED (ALLOW 2-4 MONTHS FOR IMPROVEMENT)

Vitamin B2 (Riboflavin)	50-100 mg BID		HA, nausea, anxiety , ataxia	
Magnesium chelated (taurine, glycinate, aspartate)	400 mg daily		Diarrhea, nausea/ emesis	Take with Food
Melatonin	1-5 mg 30 minutes before sleep		SA, drowsy	
Coenzyme Q10	100 mg/day			

INPATIENT MEDICINES

Prochlorperazine (Compazine)	0.1-0.15 mg/ kg IV, Max 10 mg		Extrapyramidal sx's; sedation, dizzy, confusion	Give Benadryl to reverse/prevent dystonic reaction
Valproic Acid (Depacon)	15 mg/kg IV push, Max 1000 mg		HA, nausea, sedation	
Dihydroergotamine (DHE)	start 0.25 mg, increase by 0.1-0.25 mg every 8 hrs up to 1 mg		Dizzy, flushing, dyspnea	Premedicate with antiemetic and Benadryl, Total max dose 20 mg
MgSO4	1 g IV slow push			

OUTPATIENT/ER IV MEDICATION FOR SEVERE HEADACHE

NS Bolus	20 ml/ kg			Max 1 liter
Ketorolac (Toradol)	1 mg/ kg IM, Max 30 mg OR 0.5 mg/kg IVq6hrs, Max 30 mg		HA, nausea, SA, dyspepsia	Do not exceed 5 days
Prochlorperazine (Compazine)	0.1-0.15 mg/ kg IV, Max 10 mg		Extrapyramidal sx's; sedation, dizzy, confusion	Give Benadryl to reverse/prevent dystonic reaction
Diphenhydramine (Benadryl)	1mg/kg		drowsy, dizzy	Reduces SE's of prochlorperazine, Max 300mg/ day

**THESE ARE GUIDELINES AND PROVIDERS ARE FULLY RESPONSIBLE FOR THE CORRECT DOSAGES, AGES AND SIDE EFFECTS WHEN PRESCRIBING

Appendix 8 **HEADACHE TRIGGERS**

There are many possible triggers for migraine headaches. Although there is little scientific evidence confirming these triggers as a cause of headaches, most people agree that identification and avoidance of triggers can reduce the frequency of migraine headaches. The following is a list of some of the most commonly reported headache triggers.

Several foods have been identified as possible triggers for migraine. However, clinical research has never found a food which is a reliable predictor of headaches.

- chocolate
- cheese
- cured meats
- citrus fruits

Other Common Headache Triggers:

- Dehydration
- Excess caffeine
- Lack of sleep
- Skipped meals
- Stress
- Monosodium glutamate (MSG)
- Artificial sweeteners such as aspartame

**Provided by PCH Department of Pediatric Neurology. This may be copied and/or used as a handout to give parents or patients

ACKNOWLEDGEMENT

This project consumed a large amount of time and dedication. These guidelines would not have been possible without the time and support of many individuals and organizations. Therefore, we would like to extend our appreciation to all of them.

Children's Health Accountable Care Collaborative (CHACC) - a group that resides under Community Care of North Carolina (CCNC)

Phoenix Children's Hospital – Pediatric Neurology group

Reena Gogia Rastogi M.D. – Pediatric Neurologist, Phoenix Children's Hospital (no financial disclosures)

Amy Shoptaugh M.D., F.A.A.P. - All About Kids Pediatrics, Tempe, AZ (no financial disclosures)

Alan Stiles M.D., FAAP

Dave Tayloe M.D., FAAP - Goldsboro Pediatrics, PA, Past President of the AAP (2008-09)

Steve Wegner M.D., FAAP