Pediatric Headache Treatment and Referral Guidelines

Community Care OF NORTH CAROLINA

Developed by pediatric neurologists across North Carolina, including those from Carolinas Health Care, Duke University, East Carolina University, University of North Carolina, and Wake Forest University, primary care providers, and academic general pediatricians.

This guideline, for use by primary care providers, explains the evaluation, treatment, and referral process for children and adolescents (ages 3-21 years) whose chief complaint is headache.

Introduction

Headaches are common in children (3% for ages 3-7 years) and even more so in adolescents (8% to 23% for ages 11-15 years).

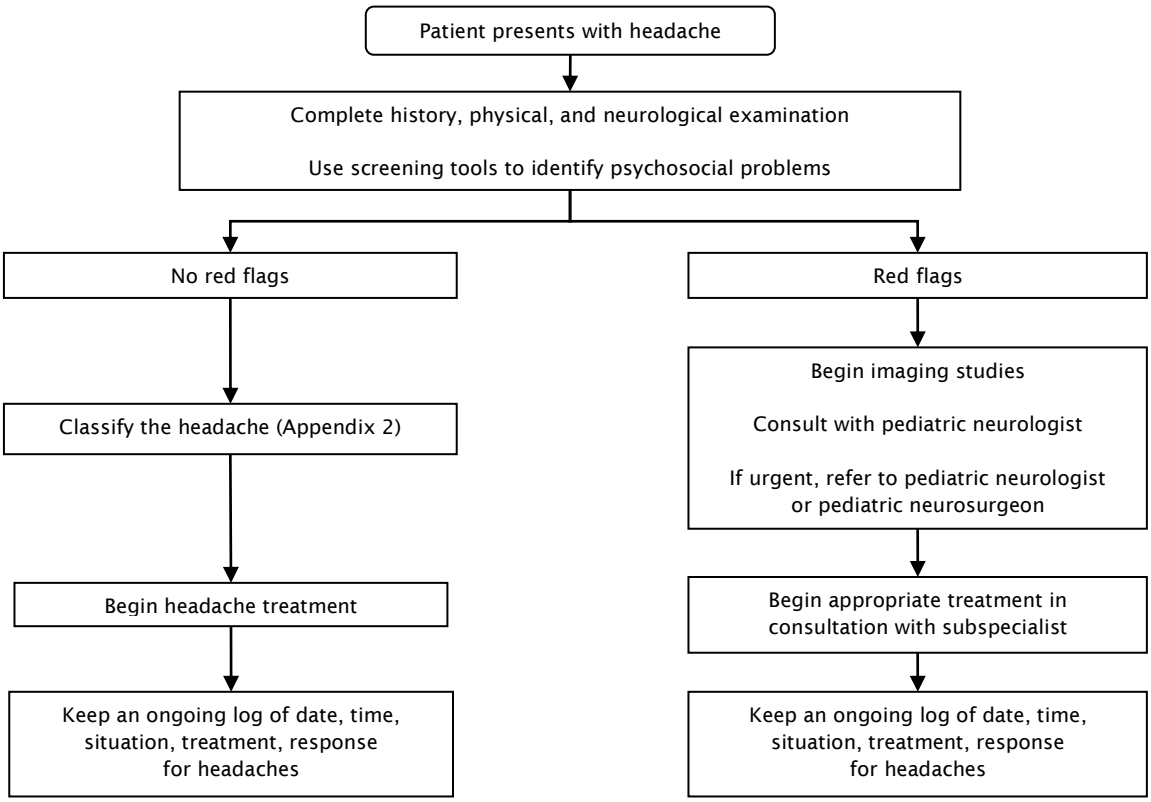
Initial Evaluation of Childhood Headaches

The history and physical examination are the best way to identify the cause of the head pain. At the time the family schedules the first headache appointment, they could be asked to complete the Pediatric Headache Symptom Checklist in Appendix 1. Use screening questionnaires to identify significant psychosocial problems.

Laboratory and imaging studies are only useful if red flags are identified by history or physical examination. Red flags should prompt the provider to proceed with imaging studies, obtain telephone or on-line consultation from a pediatric neurologist, or refer to a pediatric neurologist or pediatric neurosurgeon for urgent consultation if available; otherwise discuss with appropriate referral service regarding the possible need to be seen more acutely in the hospital Emergency Department.

As a first step, the headaches should be classified as primary or secondary. Primary headaches include migraine, tension, and chronic daily headaches. The causes of secondary headaches are extensive, as noted in the Headache Classification table in Appendix 2, and diagnosis may require additional testing, consultation, or referral. Diagnostic criteria for migraine headaches are found in Appendix 3, and those for tension and chronic daily headaches in Appendix 4.

Pediatric Headache Algorithm



History	Red Flags: 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, - happiness with school situation, - parental discord, - chronic family illnesses, - boyfriend/girlfriend problems	▪ 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 ▪ Worse with exertion, particularly in post-pubertal children ▪ Headaches associated with neurological deficits (e.g., hemiparesis, ophthalmoparesis, seizures) ▪ 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*	**Red Flags: Physical Examination**
▪ Blood pressure ▪ Review growth chart ▪ Pubertal assessment ▪ Cutaneous abnormalities ▪ Head and neck ▪ Nose and throat inspection ▪ Temporomandibular joints ▪ Funduscopic ▪ Extraocular movements ▪ 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)	▪ Signs of increased intracranial pressure o Large or accelerating head circumference o Papilledema o Cranial nerve VI palsy ▪ Meningeal signs, fever, rigors ▪ Evidence of recent head trauma ▪ Focal neurological signs (e.g., brainstem or cerebellar signs like ocular paralysis or nystagmus and other cranial nerve abnormalities, ataxia, or hemiplegia) ▪ Altered mental status ▪ Neurocutaneous findings

*See Appendix 5 for more information on the physical and neurological examination.

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 trauma - CT preferred*
- Occipital headache – MRI preferred due to limitation of CT to view posterior fossa (e.g., 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 the radiation.

Referral

Reasons for Referral/Consultation*

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

* Primary care providers are encouraged to urgently refer or to contact pediatric neurologists/neurosurgeons by phone or on-line immediately to seek advice about children with headaches who have red flags or abnormalities on radiologic evaluation

Materials to send the pediatric neurologist at the time of referral or consultation:

1. Copies of medical records with dictated letter
2. Laboratory reports and imaging studies (CDs of the actual studies)
3. Complete list of medications, prescription and over-the-counter
4. Two-month calendar diary of date, time, severity, duration, other symptoms, triggers, and treatment for headaches

Treatment

Rescue

- Ibuprofen; diphenhydramine; ondansetron; caffeinated beverage; extra water. See Appendix 6 for medication dosages

Prevention (when headaches occurring once a week or more)

- 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 9 hours for teenagers, with no more than 2 hours of variability in sleep or wake pattern (AAP guidelines)
- Eat regular 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 & menstrual cycles
- Relaxation training, such as yoga
- Biofeedback
- Avoid overuse of over-the-counter medications (acetaminophen, ibuprofen, or naproxen) because they may produce rebound headaches
- Consider daily prescription or over-the-counter medication (Appendix 6)

Follow Up

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

Appendices

Appendix 1

Pediatric Headache Symptom Checklist

Please answer the questions below. Give this sheet to your child's primary care provider.

1. When did your headaches begin?	1. _____
2. What causes you to have a headache?	2. _____
3. Is your headache constant or episodic?	3. ☐ Constant ☐ Episodic
4. How many days a week/month do you have headaches?	4. ____ per week/month
5. How long does a typical headache last?	5. _____
6. Where is your pain when you have a headache?	6. _____
7. Do you have any signs (visual, auditory, nausea) that warn you that you are about to have a headache?	7. ☐ No ☐ Yes If yes, check all that apply: ☐ Visual ☐ Auditory ☐ Nausea
8. Do you have nausea and/or vomiting, dizziness, numbness, weakness with your headaches?	8. ☐ No ☐ Yes If yes, check all that apply: ☐ Nausea and/or vomiting ☐ Dizziness ☐ Numbness ☐ Weakness
9. Do any foods, medications, or activities cause you to have headaches?	9. ☐ No ☐ Yes If yes, what foods, medications, or activities? _____
10. Is the headache pain stabbing, dull, squeezing, or pounding in nature?	10. ☐ Stabbing ☐ Dull ☐ Squeezing ☐ Pounding
11. What makes the headache get better or go away?	11. _____
12. Does the headache stop you from participating in your daily activities?	12. ☐ No ☐ Yes
13. Do you have to go to bed when you experience a headache?	13. ☐ No ☐ Yes
14. Are the headaches more likely to occur during the week, or on weekends?	14. ☐ During the week ☐ On the weekend
15. Do you have any medical/physical symptoms between the headaches?	15. ☐ No ☐ Yes If yes, please describe: _____
16. What medications do you take for the headaches?	16. _____
17. Do you have other medical problems or do you take daily medication for a medical problem?	17. ☐ No ☐ Yes If yes, please specify: _____
18. Do other members of your family have headaches?	18. ☐ No ☐ Yes
19. What do you think is causing you to have headaches?	19. _____
20. Have you ever been evaluated or treated in another doctor's office or hospital emergency department for your headaches?	20. ☐ No ☐ Yes

Community Care of North Carolina

Appendix 2. Headache Classification

Primary Headaches

Tension headache	
Migraine headaches	▪ Migraine without aura ▪ Menstrual migraine ▪ Migraine with aura ▪ Migraine with typical aura ▪ Hemiplegic migraine - familial and sporadic ▪ Migraine with brainstem aura ▪ Retinal migraine ▪ Abdominal migraine ▪ Migraine equivalents - Benign paroxysmal torticollis and paroxysmal vertigo
Chronic daily headache	

Secondary Headaches

Trauma	▪ Post-traumatic ▪ Intracranial hemorrhage
Anatomical Abnormality	▪ Arnold-Chiari malformation
Tumors	
Increased intracranial pressure	▪ Hydrocephalus ▪ Pseudotumor cerebri
Sinus headaches	▪ Sinusitis, allergic rhinitis
Temporo-mandibular joint disease	
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 in adolescent girls, chemotherapeutics, increased clotting tendency, rheumatologic conditions
Substance abuse	▪ Alcohol ▪ Marijuana ▪ Opiates and other drugs
Epilepsy and seizures	
Affective disorders/ Psychosocial	▪ Depression ▪ Anxiety disorder

Appendix 3. Diagnostic Criteria for Migraine

Migraine without aura

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

B. Headache attacks lasting 4 to 72 hours (untreated or unsuccessfully treated). When the patient falls asleep during a migraine attach 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 of age)
- 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 one 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

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.

Appendix 4. Criteria for Tension and Chronic Daily Headaches*

Tension headaches	▪ Lasting 30 minutes to 7 days
	▪ At least 2of the following:
	  o Bilateral location
	  o Pressing/tightening (non-throbbing) quality
	  o Mild or moderate intensity
	  o Not aggravated by routine physical activity

Chronic daily headaches	▪ Occurring for 15 or more days/month for 3 or more consecutive months ▪ Daily duration of headache is usually around 4hrs

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

Appendix 5. Physical and Neurological Examination

Taken from Winner P., Lewis D., Rothner A.D., "Headache in Children and Adolescents", 2nd edition, Hamilton, Ontario: BC Decker, Inc.; 2008: page 26-28.

Physical Examination

General physical examination must include vital signs including blood pressure and temperature. Care palpation of the head and neck including an examination for sinus tenderness, thyromegaly, and nuchal rigidity should be preformed. Head circumference must be measured even in the older children because slowly progressive increases in intracranial pressure will cause macrocrania, particularly in young children. The skin must be examined for signs of neurocutaneous syndrome, particularly neurofibromatosis and tuberous sclerosis, which are highly associated with intracranial neoplasms.

Neurological Examination

Detailed neurological examination is an essential part of the evaluation.

Perhaps the best way to conduct the neurological examination is to think anatomically. Each element of the examination assesses a specific region of the brain. In the headache evaluation, we are looking for increased intracranial pressure, integrity of the brain stem, asymmetry of motor or sensory systems, coordination problems, or gait problems:

- Mental status assesses the cerebral cortex.
- Cranial nerve examination checks the brain stem function and integrity.
- The motor and sensory systems evaluate the descending and ascending pathways.
- Coordination looks at the cerebellar and vestibular pathways.
- Gait observation puts multiple systems through a dynamic challenge.

An interesting study of a large population of children with brain tumors (n=3,000) found that about two-thirds of the children had headache as one of their presenting symptoms. Over 98% of children with brain tumors with headache had neurological findings. The key features include altered mental status, abnormal eye movements, optic disk distortion, motor or sensory asymmetry, coordination disturbances, or abnormal deep tendon reflexes.

The five features given in Table 2-4 are important to utilize as part of a comprehensive exam.

Table 2-4. The Five Key Neurological Examination Elements

Look at the disks
Look for eye movements
Look for pronator drift*
Watch the tandem gait
Check the reflexes

* "Images in clinical medicine" feature "Pronator drift" comes with an online video. Darcy P, Moughty AM. *N Engl J Med* 2013 Oct 17; 369(16):e20. Doi: 10. 1056/NEJMicm1213343.

The toughest part of the neurological examination is viewing the optic nerves looking for papilledema. Direct ophthalmoscopy can be a challenge for even the most experienced physicians, particularly in the young children. The key to successful fundus examination is to have the patient fix the gaze on a far point (e.g., a still picture or object) and the examiner looks at the patient's right (or left) eye with their right (or left) eye bringing the ophthalmoscope in from the side and being careful not to obstruct the view of the target object. The optic disk is located nasally in reference to the macula and forea, so if the patient is visually fixed on a target at the horizon level, then the examiner can "find" the disk at about 30˚ to 45˚ angle to the patient. If office examination is unsuccessful, dilated opthalmoscopic examination will be necessary.

There is a new device available call Panoptic (Welsh-Allen) that has made viewing the optic nerves much easier. There is a learning curve required, but once mastered, seeing the optic nerve becomes much easier and efficient.

The value of physical and neurological examinations as well as a comprehensive headache examination (see the table below) cannot be overstated.

Comprehensive Headache Examination

1. Cervical spine examination
2. Skull: palpation of bones and muscles, and listen for bruits
3. Ears: external auditory meatus occlusion and motion
4. Temporomandibular joint: palpation range of motion
5. Nerves: palpation of supraorbital, trochlear, and occipital

   Nerves, as well as cranial nerves IX-XII
6. Eyes: palpation and inspection
7. Sinuses: modified Muller's maneuver (after a forced expiration, an attempt at inspiration is made with closed mouth and nose or closed glottis, whereby the negative pressure in the chest and lungs is made very sub-atmospheric; the reverse of a Valsalva maneuver)
8. Evaluation for increased intracranial pressure
9. Teeth: inspection, percussion, palpation
10. Carotid arteries: listen for bruits

Appendix 6. Headache Medication

Medication	Trade Name	Dosage
		Options for Outpatient Rescue Treatment for Headache **It is important to take rescue medicine as soon after onset of headache as possible and to limit triptan use to less than 10 times a month and NSAIDS to less than 15 times a month**
ibuprofen	Motrin, Advil	10 mg/kg/dose, max 40 mg/kg/day
acetaminophen	Tylenol	15 mg/kg/dose, max 1gram per dose, q6 hr
naproxen	Aleve	5 to 7 mg/kg/dose, max 1000mg/day
diclofenac sodium	Cambia	2 to 3 mg/kg/day orally in divided doses 2 to 4 times a day, max dose 200 mg/day
sumatriptan	Imitrex	25 to 100 mg by mouth at onset of migraine symptoms; repeat after 2 hours, max 200 mg/day
sumatriptan intranasal		children 5 to 12 years: 5 mg, 10 mg, or 20 mg administered in one nostril as single dose weight-based dose: 20 to 39 kg: 10 mg; >40 kg, 20 mg. Can repeat the dose in 2 hours, max 40 mg/day
sumatriptan subcutaneously		6 to 18 years: 6 mg in single dose (0.06 mg/kg/dose), max 12 mg/day
rizatriptan	Maxalt	5 mg for patients weighing less than 40 kg (88 lb); contraindicated in children under 40 kg who are also taking propanolol 10 mg for patients weighing 40 kg or more; max dose for children over 40 kg taking propanolol is 5 mg/day
zolmitriptan	Zomig	2.5 mg/dose; repeat if not relief in 2 hours; max 10 mg/day
ketorolac	Toradol	1 mg/kg IM, max 30 mg q 6 hours; 0.5 mg/kg IV, max dose 30 mg q 6 hours; max 120 mg/24 hours; 10 mg every 4 to 6 hours orally, max 40 mg/day
promethazine	Phenergan	0.25 to 05 mg/kg/dose, max 25 mg/ dose; max 75 mg/day; best to give orally or rectally. If giving IV, be very careful to give it into a large vein to avoid potential severe tissue injury. Reverse dystonic reaction with diphenhydramine (Benadryl)
prochlorperazine	Compazine	0.25 to 0.5 mg/kg/dose orally or rectally every 4 hours (max dose 7.5 mg/day for 20 to 29 lb; 10 mg/day for 30 to 39 lb; 15 mg/day for 40 to 85 lb 2.5 to 10 mg IV push for acute severe headache; can give q 3 to 4 hours, max dose 40 mg/24 hours
ondansetron	Zofran	0.15 mg/kg up to 4 mg IV, IM, or PO given up to 3 times a day for children under 12 years old and 8 mg up to 3 times a day for children 12 years old and older
metoclopramide	Reglan	0.1 to 0.2 mg/kg/dose PO, IM, IV, q 6 to 8 hours; max dose 0.8 mg/kg/24 hours
hydroxyzine	Vistaril, Atarax	6 to 12 years: 12.5 to 25 mg orally every 6 to 8 hours; max dose 100 mg/24 hours 0.5 to 1.0 mg/kg IM every 4 to 6 hour >12 years: 25 to 100 mg IM every 4 to 6 hours; 25 to 100 mg orally every 6 to 8 hours, max dose 600 mg/day

Preventative Medication

propanolol	Inderal	2 to 4 mg/kg/day divided 3 times a day, max 16 mg/kg/24 hours
amitriptyline	Elavil	0.1 to 0.25 mg/kg/dose, usually 10 to 50 mg at bedtime, max 2 mg/kg or 75 mg daily. If giving over 25 mg/24 hours, monitor cardiac status/EKG
topiramate	Topamax	start with 1 to 3 mg/kg/dose (top starting dose 25 mg) and increase slowly to maintenance dose of 5 to 9 mg/kg/day; if giving more than 25 mg, divide into 2 doses per day; max dose 400 mg/24 hours; usually effective at less than or equal to 100 mg/day divided bid
divalproex	Depakoate	DR 15 to 30 mg/kg/day, divided twice a day, max dose 1000 mg/day
cyproheptadine	Periactin	0.25-0.4 mg/kg/24 hr divided bid, max dose 16 mg/24 hr

Over-the-Counter Supplements for Prevention of Headache

potassium-magnesium aspartate	GNC brand	250 mg bid
magnesium oxide		200mg to 400mg bid with food
vitamin B2 (riboflavin)		50mg to 100 mg bid
melatonin		1 to 5 mg, 20 minutes prior to going to sleep

Inpatient Management of Headache

prochlorperazine	Compazine	0.15 mg/kg IV, max 10 mg plus ketorolac 0.5 mg/kg IV, max 15 mg
valproic acid	Depacon	15 mg/kg IV push, max 1000 mg
dihydroergotamine (DHE)		0.5mg to 1.0 mg IV every 8 hours x3, then every 12 hours x2, and then one more dose during next 3 days. Premedicate with Zofran, 0.15 mg/kg IV. May give benzodiazepam with Zofran Cannot give DHE within 24 hours of giving triptan due to risk of serotonin syndrome. Multiple side effects may preclude its use in many settings.

IV Medication for Outpatient Management of Severe Headache

normal saline bolus		20 ml/kg, max 1liter
ketorolac	Toradol	0.5 mg/kg, max dose 30 mg IM or 15 mg IV q 6 hours
prochlorperazine	Compazine	0.15 mg/kg IM/IV q 3 to 4 hours, max dose 10 mg, max 40 mg/24 hours
diphenhydramine	Benadryl	1 mg/kg, max dose 50 mg, max 300 mg/24 hours to help reduce side effects of prochlorperazine