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Headache Pathway – Initial Treatment

Arkansas Children's
HOSPITALS · RESEARCH · FOUNDATION

Differential Diagnoses to consider:
- Stroke or hemorrhage
- Intracranial mass
- Vascular malformation
- Shunt malfunction
- Meningitis/encephalitis
- Trauma/concussion
- Psychogenic

Inclusion Criteria
≥5 years with migraine or headache

Exclusion Criteria
- <5 years
- Abnormal neurologic exam
- Intracranial shunt
- Fever
- Malignancy
- Closed head injury/trauma within 24 hours Seizure
- Signs of increased ICP
- Sudden-onset headache reaching maximum intensity within 5 minutes

Signs of Cushing Triad
- Bradycardia, hypertension, abnormal breathing pattern
- Notify ED Attending if present

YES → OFF PATHWAY

Clinical Warning Signs
- GCS Score ≤ 13
- Anisocoria (unequal pupil size)
- Abnormal neurological exam
- Fever or meningeal signs
- Chronic/progressive headache, morning headaches, or headache waking from sleep

YES → OFF PATHWAY

Begin Clinical Assessment
- Complete pain assessment
- Physical exam with complete neurologic exam (attempt fundoscopic exam when possible)
- Initiate headache care and print patient education
  - -Low sensory environment
  - -Provide oral hydration as indicated
- Obtain urine pregnancy test for females > 10 years old

Assess if combination therapy is indicated:
Any of the below true?
- Already taken ibuprofen or a triptan for this headache within the last 4 hours?
- Severe pain (i.e. pain score ≥ 7)?
- Vomiting/not tolerating PO

YES

Combination Therapy Recommended
Place PIV and continue with:
- NS bolus 20 mL/kg over 1 hour (max 1 Liter)
- Prochlorperazine (Compazine) IV
  +/- Diphenhydramine IV
  OR
- Metoclopramide (Reglan) if allergy to prochlorperazine
  +/- Diphenhydramine IV
- Ketorolac IV (if > 6 hours since last NSAID dose)

Opioid use not recommended

Reassess patient in 60 minutes

Headache improved → Refer to Neurology if not previously established patient

Severe (≥7) headache persists

Administer:
- Valproic acid (if UPT negative)
- 2nd NS bolus 20 mL/kg over 1 hour (max 1 Liter)

Reassess patient in 60 minutes

If insufficient improvement:
- Consider alternative diagnoses
- Consider inpatient admission to Neurology

Consult Neurology
- Consider Magnesium sulfate
- Consider Methylprednisolone

NO

Administer:
- Ibuprofen
- Oral rehydration
- IN Sumatriptan (if > 2 hours since last dose, max 2 doses in 24 hours)

Consider:
- PO caffeine

Severe (≥7) headache persists → Combination Therapy Recommended

Reassess patient in 60 minutes

Headache improved

Discharge Instructions:
- Follow up with PCP
- If received Sumatriptan in ED, prescribe 3 doses Sumatriptan (PO for home)

Headache Pathway
Inpatient Phase

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Differential Diagnoses to consider:
- Stroke or hemorrhage
- Intracranial mass
- Vascular malformation
- Shunt malfunction
- Meningitis/encephalitis
- Trauma/concussion
- Psychogenic

Inclusion Criteria
≥5 years with migraine or headache
Exclusion Criteria
<5 years, abnormal neurologic exam, intracranial shunt, fever, malignancy, closed head injury/trauma within 24 hours, seizure, signs of increased ICP, sudden-onset headache reaching maximum intensity within 5 minutes

- Review and document failed outpatient and/or ED treatment
- Document daily medications, if applicable, and timing of last doses

- Complete History/Physical
- Review ED, pre-hospital care, prior medications, failed treatments
- Current pain score
- If no prior medications, administer medications per ED Headache Pathway
- Obtain urine pregnancy test for females >10 years of age If not previously obtained
- Adjunctive pain management interventions:
  - -Low stimulation environment*
  - -Patient education
  - -Child Life
  - -Social Work
  - -Psychology/Psychiatry

*Low Stimulation Environment:
- No cell phones
- TV off
- Lights dimmed

Insufficient Improvement
Stop:
- Valproic acid

Start:
- Diphenhydramine
- Methylprednisolone

Continue:
- Ketorolac
- Prochlorperazine

Reassess patient in 60 minutes following methylprednisolone Improved?

YES

Sufficient Clinical Improvement
- Pain score decreases by 1 point
- Patient reports subjective improvement
- Reassess every 8-12 hours to ensure continued improvement
- Continue
  - -Prochlorperazine
  - -Diphenhydramie
  - -Valproic acid or Methylprednisolone

Reassess patient in 8-12 hours Improved?

YES

Discharge criteria

NO

Insufficient Improvement

Stop:
- Methylprednisolone

Start:
- Magnesium Sulfate

Continue:
- Ketorolac
- Prochlorperazine
- Diphenhydramine

Reassess patient in 60 minutes following Magnesium Sulfate

Sufficient Improvement

Continue: Magnesium Sulfate
Ketorolac
Prochlorperazine
Diphenhydramine

Reassess patient in 8-12 hours Improved?

Sufficient Improvement

Continue: DHE
Ketorolac
Prochlorperazine
Diphenhydramine

!
DO NOT start DHE within 24 hrs of Triptans

Insufficient Improvement

Stop: Magnesium Sulfate
Start: DHE
Continue: Ketorolac
Prochlorperazine
Diphenhydramine

- DHE Protocol/Progression/Side Effect Management
- If insufficient improvement after 3 doses, discuss nerve block
- If insufficient after 5 doses consider Levetiracetam

Medications

Medication	Dose	Maximum	Route/Interval	Comment/Side Effects
Sumatriptan	5 mg, 10 mg or 20 mg	20 mg	IN	Age 5-12 (or by weight if appropriate): 5 mg Age > 12: Body weight < 20 kg – 5 mg BW 20-39 kg – 10 mg BW > 40 kg – 20 mg
Ketorolac	0.5 mg/kg	30 mg	IV Q8H	Heartburn, renal, GI toxicity, limit to 5 consecutive days (15 doses)
Metoclopramide	0.2 mg/kg	10 mg	IV Q8H	Sedation, restlessness, agitation, dystonic reaction → treat with diphenhydramine 1 mg/kg IV/PO, max 25 mg
Prochlorperazine	0.15 mg/kg	10 mg	IV Q8H	Sedation, dystonic reaction → treat with diphenhydramine 1 mg/kg IV/PO, max 25 mg
Valproic Acid	15 mg/kg	1000 mg	IV Q12H	Sedation, nausea, dizziness Significant SE rare with single dose Infuse over 20 minutes to avoid local irritation
Methylprednisolone	2 mg/kg	200 mg	IV Once daily	Start in AM if not given in the ED to minimize insomnia If effective, start famotidine to avoid GI SE, continue for a maximum of 3 days Increased appetite, agitation Hypertension, hyperglycemia Infuse over 1 hour to avoid local irritation
Magnesium sulfate	50 mg/kg	1000 mg	IV Q12H	If patient not on telemetry, max rate of infusion is 25 mg/kg/hr for patients < 40 kg or 1 g/hr for patients > 40 kg Infuse over 1 hour, increase to 2 hours to avoid side effects Dizziness, sedation, burning, hypotension STOP infusion if symptomatic hypotension, arrhythmia, CNS depression, apnea
Levetiracetam	20 mg/kg	1000 mg	IV Q12H	Sedation, irritability
Caffeine Citrate	200 mg		PO	For patients ≥ 12 years of age 60 mg/3 mL (20 mg/mL)

DHE Protocol

Dihydroergotamine (DHE) Protocol:

Age in years	Starting dose	Dose titration	Maximum dose
6 - <10 **OR** <25 kg	0.1 mg	If tolerated, increase by 0.1 mg every 8 hours until maximum dose or side effects occur	0.5 mg IV every 8 hours
≥ 10-12	0.2 mg	If tolerated, increase by 0.2 mg every 8 hours until maximum dose or side effects occur	1 mg IV every 8 hours
≥ 12	0.25 mg	If tolerated, increase by 0.25 mg every 8 hours until maximum dose or side effects occur	1 mg IV every 8 hours

Continue DHE for at least 5 doses and up to 20 doses; if headache relief occurs, give one additional dose.

Complete any needed imaging prior to DHE.

To be included in this addendum:

Insufficient Improvement after DHE

Insufficient improvement after 3 doses	Discuss nerve block with patient/family while continuing DHE PFE for nerve block If interested in nerve block, contact Headache Team via email Consider adding one/both of the following for at least 2 doses for synergy with DHE: Valproic Acid Magnesium Sulfate
Insufficient improvement after 5 doses	Consider trial dose of Levetiracetam

Tips for managing DHE side effects:

- Nausea/vomiting:
  - Premedicate with metoclopramide or ondansetron
  - If significant nausea occurs with the first dose, decrease the dose by 50% and advance as tolerated
- Worsened headache: Decrease the DHE dose to what was previously tolerated and advance as tolerated.
- Muscle cramping: PRN lorazepam or diazepam, can consider premed prior to future doses
  - Reduce dose to previously tolerated level and advance as able.
  - Consider acute treatment of throat tightness or muscle spasm with benzodiazepine and then for future doses, administer oral benzo as premedication 30 minutes prior to DHE
- Chest pain: Check EKG immediately and repeat in 6 hours. Decrease dose to what was previously tolerated and advance as able. If this occurs after first dose, decrease dose by 50%.
  - Repeat EKG daily.
  - Stop DHE if pain continues despite lower does or if EKG shows signs of ischemia
- Vasospasm: heat packs prn, stop infusion if severe
- Ergotism/DVT: Rare. Stop infusion/discontinue DHE

Discharge Criteria

- Headache resolved, or decreased to baseline level in those with constant baseline pain. Headache has also remained at baseline level for 12 hours after last intervention and even with increased activity.

- The patient and/or parent(s) feel as if the headache has improved to the point where the child can function. If patient has previously experienced rebound headaches within 24 hours of IV treatments in the past, aim for the first discharge criteria and consider administering a dose of methylprednisolone prior to discharge if not given within the preceding 24 hours.

- Headache has not improved, but patient, parent, and inpatient team feel that benefits of continued inpatient treatment are outweighed by adverse effects, or available options have been exhausted. In this situation, it will be very important to stress continued multidisciplinary outpatient management, including the use of preventive medications and psychological counseling, namely, cognitive behavioral therapy. This patient will be set up with a follow-up appointment in the Headache Clinic within 2-3 weeks, either by telemedicine or in-person and a referral should be made to a local psychologist upon discharge or to the Headache program psychologist.

- All patients admitted on the Headache Pathway will receive follow-up in the Headache Clinic within 3-4 weeks of discharge, either via telemedicine or in-person.

Contributing Members

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Metrics

- ED LOS
- Admission rate
- Revisit rate at 72 hours for same complaint
- Time from patient arrival to completion of first line medications
- Time from completion of first line medication to order for second line medication
- Order set utilization

Goals

- Standardize and improve the treatment for migraine headache
- Decrease ED LOS
- Decrease hospitalization