Headache Pathway – Initial Treatment

**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
- 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

**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

**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

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

**Opioid use not recommended**

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

**Consider**
- PO caffeine

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

**Consult Neurology**
- Consider Magnesium sulfate
- Consider Methylprednisolone

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

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

**Refer to Neurology if not previously established patient**

**Severe (≥7) headache persists**
- Reassess patient in 60 minutes
- Reassess patient in 60 minutes
- Headache improved

**Headache improved**
- Reassess patient in 60 minutes
- Reassess patient in 60 minutes

**Severe (≥7) headache persists**
- Headache improved
- Headache improved

**Last Updated**
6-2-22
Headache Pathway
Inpatient Phase

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

### Exclusion Criteria
- <5 years
- 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

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

### Insufficient Improvement
**Stop:**
- Valproic acid

**Start:**
- Dihydropyrimidinone
- Methylprednisolone

**Continue:**
- Ketorolac
- Prochlorperazine

### Sufficient Clinical Improvement
**Stop:**
- Methylprednisolone

**Start:**
- Magnesium Sulfate

**Continue:**
- Ketorolac
- Prochlorperazine
- Dihydropyrimidinone

### Insufficient Improvement
**Stop:**
- Magnesium Sulfate

**Start:**
- DHE

**Continue:**
- Ketorolac
- Prochlorperazine
- Dihydropyrimidinone

### Sufficient Improvement
**Continue:**
- Magnesium Sulfate
- Ketorolac
- Prochlorperazine
- Dihydropyrimidinone

**DO NOT start DHE within 24 hrs of Triptans**

### Insufficient Improvement
**Stop:**
- Magnesium Sulfate

**Start:**
- DHE

**Continue:**
- Ketorolac
- Prochlorperazine
- Dihydropyrimidinone

### Sufficient Improvement
**Continue:**
- DHE
- Ketorolac
- Prochlorperazine
- Dihydropyrimidinone

### Discharge criteria

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

### 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

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

**Reassess patient in 60 minutes following methylprednisolone Improved?**

**Insufficient Improvement**

**Stop:**
- Dihydropyrimidinone

**Start:**
- Magnesium Sulfate

**Continue:**
- Ketorolac
- Prochlorperazine
- Dihydropyrimidinone

**Reassess patient in 60 minutes following Magnesium Sulfate**

**Insufficient Improvement**
**Stop:**
- Magnesium Sulfate

**Start:**
- DHE

**Continue:**
- Ketorolac
- Prochlorperazine
- Dihydropyrimidinone

**Sufficient Improvement**
**Continue:**
- DHE
- Ketorolac
- Prochlorperazine
- Dihydropyrimidinone

**Reassess patient in 8-12 hours Improved?**

**Discharge criteria**
<table>
<thead>
<tr>
<th>Medication</th>
<th>Dose</th>
<th>Maximum</th>
<th>Route/Interval</th>
<th>Comment/Side Effects</th>
</tr>
</thead>
</table>
| 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)                                                                                                                                 |

**Note:** Always consult with a healthcare professional before administering any medication.
**Dihydroergotamine (DHE) Protocol:**

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Starting dose</th>
<th>Dose titration</th>
<th>Maximum dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 - &lt;10 OR &lt;25 kg</td>
<td>0.1 mg</td>
<td>If tolerated, increase by 0.1 mg every 8 hours until maximum dose or side effects occur</td>
<td>0.5 mg IV every 8 hours</td>
</tr>
<tr>
<td>≥ 10-12</td>
<td>0.2 mg</td>
<td>If tolerated, increase by 0.2 mg every 8 hours until maximum dose or side effects occur</td>
<td>1 mg IV every 8 hours</td>
</tr>
<tr>
<td>≥ 12</td>
<td>0.25 mg</td>
<td>If tolerated, increase by 0.25 mg every 8 hours until maximum dose or side effects occur</td>
<td>1 mg IV every 8 hours</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Insufficient improvement after 3 doses</th>
<th>Discuss nerve block with patient/family while continuing DHE PFE for nerve block</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>If interested in nerve block, contact Headache Team via email</td>
</tr>
<tr>
<td></td>
<td>Consider adding one/both of the following for at least 2 doses for synergy with DHE:</td>
</tr>
<tr>
<td></td>
<td>Valproic Acid</td>
</tr>
<tr>
<td></td>
<td>Magnesium Sulfate</td>
</tr>
</tbody>
</table>

| 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 doses 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

Dr. Paul Drake – Neurology
Dr. William Walters - Neurology
Dr. Aravindhan Veerapandiyan – Hospital Medicine
Dr. Randa Othman – Hospital Medicine
Bonnie Kitchen, APRN – Hospital Medicine
Dr. Melissa Magill – Emergency/Hospital Medicine ACNW
Dr. Nicholas Hobart-Porter – Emergency Medicine
Mandy Baker - Pharmacy
Emily Rader, RN - Clinical Effectiveness & Outcomes Manager
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