Headache in the Emergency Department

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Disclosures

- Book royalties for headache (Neurology in Practice services) from Wiley
- Legal expert witness testimony

Headache in the Emergency Department (ED)

1. Epidemiology of primary and secondary headache in the ED
2. Why do headache patients go to the ED?
3. Secondary headache in the ED
4. Management of status migrainosus / intractable headache in the ED
5. Disposition of headache patients after discharge from the ED
6. Discharge recommendations for minimizing future headache-related ED visits
7. Summary
Scope of the Problem: Headache is Prevalent and Relevant

- "Headache" accounts for 2.8% of all ED visits
  - 5 million ED headache visits per year
- 4th most common complaint in ED
  - #1 – Stomach-related symptoms
  - #2 – Chest pain
  - #3 – Fever
  - #4 – Headache
  - #5 – Back symptoms

[Link to CDC data]

Headache Repeaters in the ED

- 10% of the ED patients that present with headache are "headache repeaters"
- "Headache Repeaters" account for 50% of the ER visits for headache


Primary and Secondary Headaches in the ED

- **Primary Headaches**
  - Most ED "headache" patients (54%-95%) have a primary headache
  - Highest prevalence in the 18-50 range
- **Secondary Headaches**
  - Minority of ED "headache" patients (8%-42%) have a secondary headache
  - Highest prevalence in children and the elderly
  - Most common: systemic or ENT infection; post-traumatic
  - Most sinister: SAH, intracerebral hemorrhage, meningitis (usually <2%)
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Why Do Headache Patients Go to the ED?

1. Headache non-responsive to usual medications
2. Usual headache medications unavailable/inaccessible
3. Unusual severity of headache
4. Associated GI symptoms
5. Associated neurologic symptoms
6. Long duration of headache with headache related disability (Status migrainosus)
7. “Last straw syndrome”
8. Sudden - onset severe headache
9. Headache related anxiety (ie, Secondary cause?)
10. Physical +/- emotional dependence on opioids

Why Do Patients Use an Urban ED For Treatment of Acute Headache?
Cross-sectional study 453 patients presented for management of HA

<table>
<thead>
<tr>
<th>Healthcare access</th>
<th>210 (46%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No doctor/ nowhere to go</td>
<td>69 (15%)</td>
</tr>
<tr>
<td>Couldn’t get appointment soon enough</td>
<td>60 (13%)</td>
</tr>
<tr>
<td>My clinic or doctor’s office is closed</td>
<td>74 (16%)</td>
</tr>
<tr>
<td>Financial (no insurance, can’t afford doctor)</td>
<td>7 (2%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceived emergency condition</th>
<th>151 (33%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(referred by MD, unbearable pain)</td>
<td>29 (6%)</td>
</tr>
<tr>
<td>Preference (get good care in ED)</td>
<td>4 (1%)</td>
</tr>
<tr>
<td>Geographical/ Transportation</td>
<td>59 (13%)</td>
</tr>
<tr>
<td>Other</td>
<td>39 (8%)</td>
</tr>
</tbody>
</table>
Data From AMPP – National Sample

<table>
<thead>
<tr>
<th>Reason for visit</th>
<th>n</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived emergency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unbearable pain</td>
<td>605</td>
<td>79%</td>
</tr>
<tr>
<td>Concern about significance of pain</td>
<td>173</td>
<td>23%</td>
</tr>
<tr>
<td>Referred by physician</td>
<td>8</td>
<td>1%</td>
</tr>
<tr>
<td>Associated symptoms</td>
<td>7</td>
<td>1%</td>
</tr>
<tr>
<td>Healthcare access</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCP unreachable/ inaccessible</td>
<td>479</td>
<td>63%</td>
</tr>
<tr>
<td>Insurance/ financial barriers</td>
<td>38</td>
<td>5%</td>
</tr>
<tr>
<td>ED is primary source of care</td>
<td>46</td>
<td>6%</td>
</tr>
<tr>
<td>Better/ different medications</td>
<td>195</td>
<td>26%</td>
</tr>
</tbody>
</table>

Self-Treatment Prior to ED Visit (urban setting)

What medication did you take for your headache before coming to the ER?
"None" (28%-55%)

Take Home Points

- For Acute Care practitioner:
  - Address patient’s needs: reassurance, diagnosis, education, acute medications, chronic medications, referral
  - Consider initiating transitional therapy +/- preventative medication

- For Primary Care Practitioner or Specialist
  - Optimize patient’s acute treatment regimen
    - Provide and educate on use of primary, secondary, and rescue treatments +/- antiemetics if appropriate
    - Optimize patient’s preventative treatment regimen
  - Address comorbidities and risk factors for chronification
  - Identify patients at risk of ED visit
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Case 1

- 67 year old woman presents with "the worst headache of my life"
- Sudden, explosive, maximal at onset binuchal and bioccipital pain with holocephalic radiation and nausea
- No preceding event (ie, trauma, infection, coughing, sexual activity, valsalva maneuver, exertion, or sleep) or positional component

Case 1

- First headache ever like this one – no relief with acetaminophen and naproxen
- Established episodic migraine without aura
  - Fixed bifrontal location, photophobia, phonophobia, >4hr duration
  - Complete relief with acetaminophen and naproxen taken 2 days per month
- Depression since age 19 – SSRI started 2 weeks ago
Case 1

- Exam:
  - Afebrile, normotensive
  - Neurological and ophthalmological examinations unremarkable
- Headache partially resolved after IV metoclopramide and hydromorphone
- How should this headache presentation be approached?

Red Flags – SNOOP

Red Flags: Symptoms that may point to a serious underlying disorder can be evaluated by the mnemonic: "SNOOP"

- Systemic
  - Seizures, hypertension, skull-brain, oedema, processing the headache, fever, right ventricular
  - Acute, weight loss, in the morning, headache, transcranial, arterial

- Neurological
  - Neurological, confusion, dizziness, paresthesias, visual field

- Onset
  - Sudden and/or first ever, severe or "worst" headache of life, "thunderclap" headache (onset

- Pattern
  - Change in frequency, severity, or clinical features of the attacks, temporal evolution over days/months,
  - Change in circumstances, physical activity, balance
  - Seizure, vision, vomiting, or change in personality

Secondary Headache Disorders

<table>
<thead>
<tr>
<th>Condition</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain tumors</td>
<td>Tumors in the brain, usually malignant, often rapid onset of symptoms, sudden</td>
</tr>
<tr>
<td>Bone metastases</td>
<td>Metastatic disease in bone, pain, tenderness, invasion, rapid progression.</td>
</tr>
<tr>
<td>Carcinomatous meningitis</td>
<td>Meningeal route, usually malignant, headache, fever, neck stiffness.</td>
</tr>
<tr>
<td>Cerebral emboli</td>
<td>Obstructive symptoms, headache, fever.</td>
</tr>
<tr>
<td>Cerebrovascular accidents</td>
<td>Stroke, hemorrhage, repeated episodes, focal weakness.</td>
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</tr>
<tr>
<td>Cerebral venous sinus thrombosis</td>
<td>Headache, sweating, fever.</td>
</tr>
<tr>
<td>Chiari malformations</td>
<td>Headache, neck pain, dizziness, focal weakness.</td>
</tr>
<tr>
<td>Cortical vein and venous sinus</td>
<td>Thrombosis, headache, visual disturbances, altered mental function.</td>
</tr>
<tr>
<td>Pheochromocytoma</td>
<td>Headache, nausea, vomiting, palpitations, sweating.</td>
</tr>
<tr>
<td>Obstructive sleep apnea</td>
<td>Snoring, sleepiness, headaches.</td>
</tr>
<tr>
<td>Paget’s disease</td>
<td>Bone pain, deformity, headache, fatigue.</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Headache, nausea, vomiting, gastrointestinal symptoms.</td>
</tr>
<tr>
<td>Acute severe hypertension</td>
<td>Headache, confusion, seizures, hypertension.</td>
</tr>
<tr>
<td>Acute or chronic post-traumatic</td>
<td>Headache, confusion, seizures, hypertension.</td>
</tr>
<tr>
<td>Acute rhinosinusitis</td>
<td>Headache, confusion, seizures, hypertension.</td>
</tr>
<tr>
<td>Acute severe peripheral neuropath</td>
<td>Headache, confusion, seizures, hypertension.</td>
</tr>
<tr>
<td>Chronic severe peripheral neuropathy</td>
<td>Headache, confusion, seizures, hypertension.</td>
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**Case 1**

What diagnostic studies would you recommend for this patient?

Labs?

Neuroimaging?

Lumbar puncture?

Other tests?

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**Case 1**

- CT done, normal
- LP done, normal
- MRI brain, normal
- Sent home...
Case 1

Further Clinical Course

Experienced second thunderclap headache 2 days later
- Similar semiology of headache
- Returned to ER, examination normal
- What diagnostic studies would you recommend for this patient?

Case 1

Patient’s results – labs and tests
- Repeat CT scan, normal
- Repeat MRI brain, normal
- This is MRA brain at time of second ED visit
- Vasculitis workup, other lab tests, all normal
- What do you see?
Reversible Cerebral Vasoconstriction Syndrome

**Reversible Cerebral Vasoconstriction Syndrome (RCVS) Defined**

- Tranfemoral angio or CTA or MRA showing segmental cerebral artery vasoconstriction including prolonged, multifocal, usually bilateral segmental vasoconstriction
- No evidence of aneurysmal SAH
- Normal CSF
- Recurrent TCH +/- neurological signs or sx’s
- Definite RCVS: documented reversibility of angio abnormalities 12 weeks after onset or by autopsy ruling out other causes
- "Probable" RCVS (no f/u imaging), or had evidence of reversible angio abnormalities but not PACNS and no TCH.

Singhal et al. Archives of Neurology 2011; 68:1005-12

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**Neuroimaging Findings of RCVS**

- RCVS-SAH from vasospasm vs. SAH due to ruptured brain aneurysm and angio (-) SAH:
  - RCVS typically has:
    - Recurrent TCHs and small-volume SAH over hemispheric convexities in >1/3 pts
    - co-existing ICH or PRES
    - watershed > territorial infarcts
    - distinct angiographic features (early-onset, prolonged, multifocal, usually bilateral, segmental vasoconstriction and vasodilation
Take-Home Points on RCVS

- RCVS typically presents with repeated TCHs over days to weeks.
- Prior migraine in 40%, vasoactive drug exposure in 42%, and recent pregnancy in 9%.
- CT head and LP are mandatory for thunderclap headache (TCH). If negative, one may follow with MRI brain with and w/o gadolinium, MRA of brain and neck and MRV.
- Admission CT or MRI was normal in 55%; however 81% ultimately developed brain lesions.
- Suspect RCVS in patients with recurrent TCH with nl CT and LP particularly in the settings of vasoconstrictive therapy or pregnancy.
- Vasoactive medications should be stopped.
- Calcium channel blockers such as nimodipine may help reduce the intensity and frequency of the headaches.

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Case 2

- 35 year old man presenting to the ED with a prolonged headache lasting 4 days.
- Right-sided throbbing, intensity 9-10/10, light and noise sensitivity with nausea and vomiting.
- No response to ibuprofen the day before the visit to the ED.
Case 2
Established episodic migraine without aura

- Right-sided throbbing, intensity usually 6/10, light and noise sensitivity but no nausea - treated with ibuprofen - headache relief in 6 hours
- Experienced 4 similar headaches over the past 2 years that intensify to 9-10/10, lasting 3-4 days each time

Case 2

- Exam:
  - Afebrile, normotensive
  - Neurological and ophthalmological examinations unremarkable

- How should this headache presentation be approached?

ED Management of Headache Algorithm

[Diagram of ED Management of Headache Algorithm]
Ketorolac

**Dose:**
- Ketorolac 30mg IVP or 30-60 IM/IV

**Pros:**
- No interaction with previous triptan/DHE
- No sedating side-effects
- Reasonably well tolerated

**Evidence:**
- Recent systematic review of 34 studies, including 8 trials, assessing efficacy of Ketorolac for acute treatment of migraine
  - Metoclopramide and Phenothiazines > Ketorolac = Meperidine > Sumatriptan

**Cons:**
- Avoid in patients with GI ulcer, renal disease, NSAID hypersensitivity, bleeding diathesis
- 7 benefits short lasting

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Dopamine Receptor Antagonists

**Dose:**
- Metoclopramide 10 mg IVP over 2 minutes
- Prochlorperazine 10mg IVP over 2 minutes
- Pre-treat with IV Fluid Bolus
- Pre-treat with IV Diphenhydramine 25-50mg

**Pros:**
- Useful in prolonged attacks, status migrainous
- Anti-pain, anti-emetic, sedating
- Can be used in pregnancy

**Evidence:**
- Systematic review of treatment of migraine in ED – Prochlorperazine and Metoclopramide received strong recommendation supporting their use

**Cons:**
- Side effects
  - Akathisia and other extrapyramidal side effects
  - Sedation
  - Hypotension

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Case 2

- After receiving IV Ketorolac 30mg, IV Metoclopramide 10mg, and IV Diphenhydramine 25mg, his pain improved from a 9-10/10 — 6/10
- What additional treatment(s) can be provided to offer more complete relief?
Corticosteroids

**Dose:**
- Dexamethasone 4-8mg IVP
- Hydrocortisone 100mg-200mg

**Pros:**
- Well tolerated
- Activating rather than sedating

**Cons:**
- Rare risk of avascular necrosis
- Hypertension, hyperglycemia, alteration of sleep/mood

**Evidence:**
- Meta-analyses, 25 studies involving over 4,000 patients indicate potential benefit of using IV dexamethasone to prevent headache recurrence up to 72 hours after discharge from ED.

Colman I et al. BMJ 2008; 336 (7657) : 1359-1361

Valproate Sodium

**Dose:**
- 500-1000mg/50ml NS over 20 minutes

**Pros:**
- No interaction with previous triptan/DHE
- No cardiac side effects
- No sedating side effects
- Reasonably well tolerated

**Cons:**
- Contraindications include liver dysfunction, failure or transplant, known anticonvulsant hypersensitivity, or pregnancy
- Possibility of hyperammonemia with encephalopathy when given to patients on topiramate

**Evidence:**
- Some support for its use in open-label studies and some recent support in comparator trials, but no placebo-controlled studies have evaluated its efficacy in patients with status migrainosus or intractable migraine.

Magnesium Sulfate (MgSO4)

**Dose:**
- 1 gram Magnesium Sulfate IV over 1 hour

**Pros:**
- Reasonably well tolerated
- No cardiac contraindications, can be used with other medications
- Can be used in pregnancy

**Cons:**
- Flushing, hypotension

**Evidence:**
- Magnesium Sulfate may exert therapeutic effect through antagonism of NMDA receptors, its blockade of cortical spreading depression, or both
- Mixed evidence of effectiveness for acute migraine in ED
  - 2 placebo-controlled trials: 1 with no improvement vs placebo and 1 demonstrating significant difference favoring MgSO4 in a migraine with aura subgroup

Blumenfeld A et al. Headache 2013

Dihydroergotamine (DHE)

**Dose:**
- 5 mg DHE 0.5mg to 1mg
- Pretreat with IV Metoclopramide 10mg
- Pretreat with IV Prochlorperazine 10mg
- Pretreat with Ondansetron 4-8mg IV or
- Pretreat with 3H Hydroxyaspartate 50mg

**Pros:**
- Migraine-specific, low recurrence rate
- Useful in prolonged attacks, status migrainosus

**Cons:**
- Cardiac/Peripheral Vascular Disease
- Triptan use in the previous 24 hours

**Side effects:**
- Nausea, vomiting (decreased by antiemetic)
- Abdominal cramps, diarrhea

**Evidence:**
- 50% reduction in head pain at 1 hour with IV administration in ED

Gabizon M, Bello N. Headache 1991;31(1):49-71

Peripheral Nerve Blocks

- Established and safe treatment for acute migraine and status migrainosus
- Potential benefit of short-term prophylaxis
Potential Indications for Peripheral Nerve Blocks in the Treatment of Headache Disorders

<table>
<thead>
<tr>
<th>Nerve Block Type</th>
<th>Nerve(s)</th>
<th>Technique</th>
<th>Success Rate</th>
<th>Study Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervicogenic pain</td>
<td>GON, LON, SON</td>
<td>Evidence based</td>
<td>High</td>
<td>Case series</td>
</tr>
<tr>
<td>New daily persistent headache</td>
<td>GON</td>
<td>Evidence based</td>
<td>High</td>
<td>Case series</td>
</tr>
<tr>
<td>Chronic daily headache</td>
<td>GON</td>
<td>Double blind, placebo controlled</td>
<td>High</td>
<td>Case series</td>
</tr>
<tr>
<td>Migraine</td>
<td>GON, STN, SON</td>
<td>Retrospective</td>
<td>High</td>
<td>Case series</td>
</tr>
</tbody>
</table>

ATN = auriculotemporal nerve; GON = greater occipital nerve; LON = lesser occipital nerve; SON = supraorbital nerve; STN = supratrochlear nerve.

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What Happens to Headache Patients After Discharge From the ED?

- Suggested goal for ED treatment of episodic migraine: headache free upon discharge and continuing pain freedom for at least 48 hours post discharge
  - Only occurs in 20%-25% of patients
- Approximately 2/3 leave with ongoing pain
  - Of these, pain persists >24 hours in 2/3
- Approximately 1/3 leave pain free
  - Of these, headache returns in 1/3
What Happens to Headache Patients After Discharge From the ED?

- Overall, 50% are not back to normal function at 24 hours
- 75% require additional medications between 24-72 hours
- Neurology follow-up ordered in only 22%
- Predictors of poor post-ED outcome:
  - Severe pain at baseline
  - Presence of nausea
  - Longer duration of headache
- ED treatment suboptimal : inadequate IV fluid hydration, lack of combination therapies, too many opioids

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Proposed Discharge Recommendations for Treating a Migraine Headache

- Pain Free at Discharge Following IV Treatments
- Migraine
- Residual Pain at Discharge Following IV Treatments

1. Consider prescribing preventative medications
   - Consider preventative medications for patients with frequent migraines, which have a significant impact on daily activities
   - Use tricyclic antidepressants or calcium channel blockers
   - Consider prophylactic medications for patients who have frequent migraines
   - Initiation of triptans can decrease ED visits by 85%

2. Consider prescribing preventative medications

3. Provide abortive medications
   - Long-acting NSAID given twice daily until pain free for up to 3 days or
   - Long-acting NSAID given twice daily until pain free for up to 3 days

4. Provide headache education on diagnosis, triggers, biobehavioral and lifestyle modifications, keeping headache diary, and proper use of abortive medications

5. Follow up with primary care physician +/- referral to a neurologist or headache specialist
   - For patients with frequent attacks (6+/month) or with less frequent attacks which cause significant disability, suboptimal response to acute treatments and/or those at risk of medication overuse

6. Discharge recommendations for minimizing future headache-related ED visits
   - 75% require additional medications between 24-72 hours

7. Follow-up visits with primary care provider in 7 days referred to a neurologist or headache specialist
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Summary

- Headache is a common reason for visits to an ED, with the majority having a primary headache.
- Patients with headache go to an ED for recurring signs or symptoms, pain unrelieved by appropriate medication, inadequate outpatient diagnosis or treatment and healthcare access difficulties.
- Ominous causes of thunderclap headache can be present even in the absence of normal CT and LP findings.
- Treatment of status migrainosus and intractable migraine should focus on the use of IV fluids, a combination of medications rather than a single agent, and the avoidance of opioids.
- Discharge care should address headache education, proper use of an abortive regimen, consideration of the need for a preventative agent, transitional therapy if still experiencing residual head pain, and follow up with the patient’s primary care provider and/or a neurologist or headache specialist.

Hartford Healthcare Headache Center Team