Pharmacological and behavioral management of pediatric headaches

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Objectives

• Discuss common headache classifications in children

• Discuss evaluation and treatment of pediatric headaches

• Discuss psychosocial assessment and behavioral interventions for pediatric headaches
Outline

- Bio-psychosocial Conceptualization
- Headache Classification
- Medical Assessment
  - History, Red flags, Physical Exam, Imaging, Differential Diagnosis
- Medication Treatment
  - Abortive, Overuse, Preventive
- Psychosocial Considerations
  - Risk factors, Stress Response, Pain Behaviors, Functional Disability, Gate Control Theory
- Psychosocial Assessment
  - Impact, Associated Features, Lifestyle
- Non-Pharmacological Treatment
  - Psychoeducation, Stress Management, CBT, Biofeedback, Relaxation. Parent Operant, Functional Restoration
- Considerations for PCPs
Clinic Conceptualization of Headaches

• Chronic, versus episodic headaches, are traditionally more difficult to treat

• A bio-psychosocial, multidisciplinary approach is considered essential for effective management of chronic pediatric headaches
Biopsychosocial Headache Components

Biological
- Genetic pre-disposition
- Symptoms
- Pain Characteristics
- Frequency
- Triggers
- Effects of medications
- Fight-Flight Response

Psychosocial
- Pain beliefs
- Coping Strategies
- Adherence
- Functioning
- Stress
- Premorbid psychiatric concerns
- Other’s response to child’s pain
- Pain pattern

Lifestyle
- Eating habits
- Sleep patterns and hygiene
- Caffeine Use
- Exercise/Activity
- Water intake

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Non-Pharmacological Interventions and Lifestyle Modifications are equally important as Medications in Headache Management
Headache Classification

• International Headache Society (IHS) Classification ICHD-II (The International Classification of Headache Disorders, 2nd edition)

• http://www.ihs-classification.org/en/
Types of Headaches

• Primary headaches are common in children
  – Migraine
    • A common disabling primary headache disorder

  – Tension-type headache
    • Most common type of primary headache
Pediatric Migraine: ICHD-II

A. At least five attacks fulfilling criteria B-D
B. Headache attacks lasting 2-72 hours (untreated or unsuccessfully treated) (4-72 hours in adults)
C. Headache has at least two of the following four characteristics:
   1. Unilateral location (more often bilateral in children)
   2. Pulsating quality (throbbering, varying with heartbeat)
   3. Moderate or severe pain intensity
   4. Aggravation by or causing avoidance of routine physical activity such as walking or climbing stairs

D. During headache at least one of the following:
   1. Nausea and/or Vomiting
   2. Photophobia and Phonophobia

E. Not better accounted for by another diagnosis
Migraine

- **Migraine with aura** (less common)
- **Migraine without aura** (more common)
- Childhood syndromes as precursors:
  - infant colic, benign paroxysmal torticollis, benign paroxysmal vertigo, abdominal migraine, cyclic vomiting syndrome
- **Chronic Migraine**: ≥15 per month for 3 months
- **Complicated Migraine**: Neuro deficits
- **Status Migrainosus**: >72h
Tension-Type Headache: ICHD-II

A. < 15 days/month and fulfilling criteria B-D
B. Headache lasting from 30 minutes to 7 days
C. Headache has at least two of the following characteristics:
   1. Bilateral location
   2. Pressing/tightening (non-pulsating) quality
   3. Mild or moderate intensity
   4. Not aggravated by routine physical activity such as walking or climbing stairs
D. Both of the following:
   1. No nausea or vomiting (anorexia may occur)
   2. No more than one of photophobia or phonophobia
E. Not attributed to another disorder
Tension-Type Headache

- **Infrequent:**
  - At least 10 episodes, <1 day/month.

- **Frequent:**
  - At least 10 episodes, ≥1 but <15 days per month for at least 3 months.

- **Chronic:**
  - ≥15 days per month on average for >3 months.
  - Headache lasts hours or may be continuous.
  - There may be mild nausea, photophobia or phonophobia.
Headache History

- Onset
  - Acute
- Location
- Frequency
- Duration
- Description
- Intensity/Pain Scores
- Progression
- Patterns
- Triggers
- Aggravating factors
- Alleviating factors
Headache History

• Associated Symptoms
  – Nausea, vomiting, photophobia, phonophobia
  – Neurological symptoms
  – Systemic disease or symptoms
• Positional component
• Exertional component
• Nocturnal awakenings
• Early morning vomiting
• Prior headache history and treatments
  – Previous headache history with new or different headache features
Past Medical History

• Allergies
• Illnesses (chronic issues, HTN, ADHD, asthma, diabetes, obesity, sleep and mood concerns)
• Injuries (including head/neck, concussion)
• Medications
• Menstrual history for females
• Previous exams
  • Imaging history (MRI, CT)
  • Previous blood work (CBC, thyroid)
  • Last eye exam with eye professional
Family History

- Migraine or headache history
  - Positive migraine family history is reassuring
- Stroke
- Aneurysm
- Masses/tumors
- AVM
- Blood clotting disorders
Physical Exam

- Pertinent systems according to history
- HEENT
- Full neurologic exam, including fundoscopic exam
  - Exam is usually normal with migraine
  - Abnormal exam
Red Flags: When to Image

- New onset severe headache
- “Worst headache ever”
- <6 years of age
- Occipital headache
- Abnormal neurological exam
- Headache with:
  - systemic disease or symptoms
    - fever, weight loss and/or malignancy
  - neurological signs or symptoms
  - worsening acutely/progressive symptoms
  - nocturnal awakening
  - early morning vomiting
  - history of trauma
  - papilledema or diplopia
  - exertional or positional aspects
• **Brain MRI**
  – Preferred over CT (unless emergent situation)
  – More sensitive than CT
  – Occipital area, orbits and/or sinuses are seen well
  – No radiation exposure

• **Head CT**
  – Sensitive for acute intracranial hemorrhage
  – Quick and relatively inexpensive
  – Limited contraindications
  – Initial study of choice for acute head trauma, SAH, MR contraindications

• Rarely need both CT and MRI
Differential Diagnosis

- Space occupying lesion (tumor)
- Pseudo tumor cerebri (benign intracranial hypertension)
- AVM, Chiari Malformation
- Meningitis, Encephalitis
- Epilepsy
- Head Trauma
- CSF leak
- TMJ or dental issues
- Sinusitis
Medication Treatment

• **Abortive/Breakthrough**
  – Use with first sign of pain, avoid regular use, used only as needed
  – Maximum 2 doses/week to avoid medication overuse headache

• **Preventive**
  – Can consider if more than 2 headaches a week
  – Used daily
  – Should be selected based on comorbidities, side effects, medication adherence

• Many treatments for migraine are not FDA-approved
Breakthrough Medications

• OTCs, +/- caffeine
  – Ibuprofen, Naproxen, Tylenol, Excedrin Tension

• Prescription NSAIDS
  – Diclofenac, Naproxen, Ketorolac, Meloxicam

• Tramadol (ultram)

• Triptans (migraine only)

• Avoid opioids (oxycodone, Percocet, hydrocodone/acetaminophen, morphine etc)
• **Acetaminophen**: 10-15mg/kg q4-6h PRN
  – Max 75mg/kg/day or 4000mg

• **Acetaminophen & Caffeine**: 500mg-65mg (Excedrin Tension): >50kg: 1 tablet q6-12h PRN
  – Do not recommend Excedrin Migraine (contains aspirin) or Fioricet (contains butalbital)
**NSAIDs**

- **Ibuprofen** 10mg/kg q6h PRN
- **Naproxen** 5mg/kg q12h PRN
- **Diclofenac** 2-4mg/kg divided q8-12h PRN
  - Max 200mg/day
Tramadol

• 1-2mg/kg q6-12h PRN (tab)
  – Maximum single dose 100mg and 400mg/day
  – Maximum 2x/day when using TCA or SSRI due possible Serotonin Syndrome
    • Do NOT use with Fluoxetine (Prozac)

• Works on the same receptors as an opioid & inhibits NE and Serotonin
  • Contraindications: Seizures
• **Rizatriptan** *(Maxalt)*
  – FDA approved for kids > age 6
  – <40kg: give 5mg once
  – >40kg: 10mg once
  – Tab, ODT

• **Sumatriptan** *(Imitrex)*
  – >12 years, Not FDA approved in Kids
  – Nasal:
    • <38kgs: 10mg
    • >38kgs: 20mg
  – Injection: 3-6mg
  – Tablet: 25mg, may repeat in 2h if needed
Triptans Cont.

• Side effects:
  – Palpitations or increased heart rate, throat or chest tightness or tingling, or anxiety, drowsiness

• Must take at first sign of migraine

• Do **NOT** give with cardiac history or cerebrovascular syndromes or peripheral vascular disease or complex migraines
Anti-Emetics

- **Ondansatron** *(zofran)* 0.1mg/kg q6-8h PRN, max 4mg

- **Prochlorperazine** *(compazine)* 5mg q6-8h PRN
  - More often used in migraine cocktail at home
    - Compazine, NSAID and Diphenhydramine *(Benadryl)* 25mg PO + oral hydration
Avoid Medication Overuse

• Frequent use of abortive medications can lead to medication overuse headache
  – Typically more than 2 times per week for extended amount of time

• Risk factor for developing more frequent headaches

• Difficult to treat, likely some time to resolve
Preventive Medications

• **Goals:**
  – Reduce frequency, intensity and/or duration by at least 50%
  – Improve level of functioning, quality of life
  – Decrease/eliminate medication overuse
  – Increase response to abortive medications
  – Decrease need for abortive treatment

• **Not “zero headaches”**
Preventive Treatment Principles

- Start low and titrate up slowly
- Realistic goals
- Changes will be small over long period
- Adequate treatment duration and dose
- Choose treatments based on comorbidity and side effects
- Reevaluate treatment at regular intervals
- Medication adherence and patient buy-in should be considered

Preventive Medication Classes

• Tricyclic antidepressants (TCA)
  – Amitriptyline (elavil), Nortriptyline (pamelor)

• Beta blockers
  – Propranolol (inderal)

• Antiepileptics
  – Topiramate (topamax)
    • FDA approved for migraine prevention (>12 years)
  – Valproic Acid (depakote)
• **Amitriptyline and Nortriptyline** (less side effects)
  – Dosing 0.5-1mg/kg at night
  – Dose range 10-100mg at night (1-2h before bed)
• Baseline ECG to check QTc (<450) and then annually
• Onset slow (4-6 weeks)
• Considerations
  – **Helpful with insomnia**
  – Do not use with complex cardiac issues, caution with SSRIs
  – Avoid with suicide concern/depression: Can be fatal in overdose
  – Caution in overweight patients
  – Taper if done with therapy
• Side effects: sedation, weight gain, dry mouth, constipation, suicidal ideation
Other Antidepressants

• **SSRIs**
  – Sertraline (zoloft), Citalopram (celexa), Escitalopram (lexapro)
    • Helpful when anxiety and/or depression a large component

• Be aware of Serotonin Syndrome symptoms (increased heart rate, increased temperature, agitation),
  – Especially in addition to tramadol and/or triptan use
Beta Blockers

• **Propranolol**
  – Dosing 0.5-3mg/kg/day given q8-12h
  – Dose range 40-120mg q12h, LA is daily

• **Considerations**
  – **Helpful with anger or physical anxiety symptoms (tachycardia, sweating) or hypertension**
  – Caution with: Asthma, depression, diabetes, elite athletes
  – Taper if done with therapy

• **Side effects:** fatigue, dizziness, bradycardia, hypotension, exercise intolerance, exacerbation of asthma or depression or diabetes
Antiepileptics

- **Topiramate**
  - Dosing 25mg at night x7d & then 25mg q12h, could consider nightly dosing only, max daily dose: 200 mg
  - **Helpful with obese patients or Bipolar**
  - Avoid in patients with eating disorders
  - Side effects: Weight loss, decreased appetite, sedation, parathesias, cognitive slowing, blurred vision or eye pain

- **Valproic Acid**
  - Dosing 10-15mg/kg/day 2 divided doses; max initial dose: 250mg; max daily dose: 1,000 mg
  - Avoid in women childbearing age, possibility of birth defects; PCOS
  - Labs: Platelets, AST, ALT, at initiation, each increase and at least q6 months
  - Side effects: Drowsiness, nausea, weight gain, cognitive slowing, liver toxicity, possible increase in hair growth
Psychosocial Considerations: Why?

• Multiple systematic reviews demonstrate psychological treatments effectively reduce headache pain frequency, duration, and intensity in youth, as well as psychological contributors
  – 3- to 6-fold increase in likelihood of clinically significant improvement
  – Treatment gains are sustained
Psychosocial Considerations

• Headaches decrease quality of life

• Chronic headaches are associated with:
  – Frequent school absenteeism
  – Poor quality of life
  – Anxiety
  – Mood concerns
  – Social isolation
  – Sleep disruption

• Chronic headaches may evolve to include other somatic and psychological complaints that impact headache management and functioning:
  – Gastrointestinal complaints
  – Sleep disorders
  – Developing other pain syndromes
Risk Factors that Exacerbate Headaches

- Too little activity
- Drug/Alcohol Use
- Overweight
- Caffeine Use
- Overextended schedule
- Low life satisfaction
- Family Discord
- Abuse
- Bullying
- Disagreements with teachers
- High family expectations
- Family financial Stress
- Female
- Adolescence
- Pre-Existing Mental Health Issue
- Life Transitions
- School Stress
- Learning Difficulties or ADHD
- Parent Mental Health
- Social Stress
Psychosocial Considerations

• These factors influence headache presentation and management through:
  – Altered pain perception
  – Negative thinking patterns about pain, life stressors, and headache treatment
  – Higher likelihood of engaging in maladaptive pain coping strategies
  – Disengagement
  – Hypervigilant stress response

• Chronic pain itself is stressful and may result in excessive worry or low mood, absent from pre-existing psychological concerns
Relationship Between Stress and Pain
The Stress Response

**Fight or Flight Response**

- **Saliva flow decreases**
- **Skin**
  - Blood vessels constrict; chills & sweating
- **Heart**
  - Beats faster & harder
- **Stomach**
  - Output of digestive enzymes decreases
- **Muscles**
  - Become more tense; trembling can occur
- **Eyes**
  - Pupils dilate
- **Lungs**
  - Quick, deep breathing occurs
- **Bowel**
  - Food movement slows down
- **Blood vessels**
  - Blood pressure increases as major vessels dilate
Response to Pain

• Pain Behaviors
  – Active (preferred)
    • Distraction
    • Behavioral Activation
    • Use of relaxation techniques
  – Passive
    • Excessive Rest
    • Self-isolation
    • Activity Avoidance
Parent’s Response to Pain

• Parent thoughts about and responses to pain significantly impact a child’s pain perception and expression
  – Misguided support, overprotection, overattending to pain
  – Inadvertently reinforces passive coping and pain behaviors, increasing functional disability
Functioning

Pain
- Negative self-talk
- Poor sleep
- Missing work

Disability
- Less active
- Decreased motivation
- Increased isolation

Muscle atrophy & weakness
Weight loss/gain

Distress
Functioning

- Problems most notable in school attendance
  - School is a child’s “workplace”

- Frequent school absence results in stress associated with make up work, potentially aggravating headaches

- Frequent school absence prolongs functional disability
  - School failure, poor performance, lack of developmentally-appropriate experiences

- Presence of co-morbid difficulties increase risk for functional disability
  - Anxiety associated with less school difficulties than depression (perfectionism)
Psychosocial Assessment

• Clinical Interview with mental health provider
  – NOT comprehensive or diagnostic evaluation
  – Speak with parents and patient individually
Assess for:

- Pain Beliefs
- Pain Coping Mechanisms
- Adherence
- Level of Functional Disability
- Stressors
- Presence of Psychiatric Concerns
- Family Members’ Response
- Patterns
- Pain Impact
## Assessing Lifestyle

<table>
<thead>
<tr>
<th>Domain</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep</td>
<td>Hours per night? Sleep/wake times? Any naps? Any difficulty falling or staying asleep? Sleep hygiene (screens in bed)?</td>
</tr>
<tr>
<td>Diet</td>
<td>Type of diet, healthy or a lot of junk? Skipping any meals?</td>
</tr>
<tr>
<td>Hydration</td>
<td>Amount of water per day? Caffeine use?</td>
</tr>
<tr>
<td>Exercise</td>
<td>Amount per day and/or per week?</td>
</tr>
<tr>
<td>Stress</td>
<td>Any mood concerns (anxiety, depression)? Mental health history (treatment, therapy)?</td>
</tr>
<tr>
<td>School</td>
<td>Missing school? School avoidance? School performance? Accommodations or education plan?</td>
</tr>
<tr>
<td>Social</td>
<td>Peer/friend/family relationships? Involvement in activities? Tobacco or drug or alcohol use? Sexual activity?</td>
</tr>
</tbody>
</table>
Psychosocial Considerations in Headache Assessment

• Adolescents may minimize distress
  – Present favorably
  – Attempt to legitimize physical nature of their pain
  – Exercise caution when using self-report only
    • Clinical interview
    • Include parent report
    • Use objective observations (level of activity, school performance, etc.)

• Obtain all perspectives
Psychosocial Treatment: Gate Control Theory of Pain

Gate Open

- Fatigue
- Focus on Pain
- Anxiety
- Depression
- Stress
- Inactivity

Gate Closed

- Exercise
- Relaxation
- Ice/Heat
- Distraction
- Active Coping
Psychosocial Treatment

• **Psychoeducation**
  – Rationale for multifaceted approach
    • Help the family understand that headaches cannot be well-managed without attending to all contributors
  – Normalize stress reaction and relationship between headaches and anxiety/depression
    • Pain is **real**
    • Body can experience physical impact of stress without feeling emotionally overwhelmed or stressed
Psychoeducation: Improving Lifestyle

• Sleep Hygiene
  – Wind down time
  – No electronics in bed
  – Consistent bed time and wake time
  – Appropriate sleep duration
  – Bedtime fading
  – Stimulus Control

• Diet
  – Breakfast
  – Caffeine sparingly

• Water intake
  – 64 – 80 oz
Psychoeducation Cont.

• Exercise
  – Increased heart rate 3 times a week

• Managing Environmental Triggers

• Pill Swallowing Training
Psychosocial Treatment

• **Stress Management**
  – Problem-solving
  – Time Management
  – Adapting Schedule
  – Prioritizing leisure activities
Psychosocial Treatment

• Cognitive Behavioral Therapy (CBT)
  – Most empirically-supported psychological treatment for managing pediatric pain, including headache

  – Brief, goal-oriented therapy based on the concept that thoughts, feelings, and behaviors are interrelated and changeable
Situation
(What triggers the problem?)
Criticized at work

Thoughts
(What goes through my head?)
"I'm not good enough"

Emotions
(How do I feel?)
Worthless, anxious

Physical Reactions
(How does my body react?)
Feel tired, loss of appetite

Behavior
(What do I do?)
Avoid contact with others
Goals of CBT

- Enhance sense of control over pain
- Reduce fear of pain
- Increase functioning
- Accurately interpret bodily sensations
- Facilitate hopefulness
- Improve mood
- Decrease anxiety
Psychosocial Treatment

• **Biofeedback-Assisted Relaxation**
  
  • Instruments measure, process, and provide auditory and/or visual feedback about a patient’s autonomic arousal (e.g., peripheral temperature, heart rate, breathing rate)
  
  • Increase awareness and voluntary control over physiologic processes activated by pain or stress to create a desired change in physiology and counteract pain
Biofeedback Cont.

• Used to promote relaxation, lower impact of fight/flight response, prevent headache exacerbation, and reduce headache frequency and intensity

• Studies show children benefit more than adults
  – Requires mastery or proficiency
  – Ages 10 and up

• Studies show BFT is at-least as effect many medications for headache management
Diaphragmatic Breathing

- Reduces sympathetic arousal and activates parasympathetic nervous system
- Promotes use of diaphragm versus upper chest muscles and a slow, relaxed breathing pace
  - Slows heart rate
  - Encourages appropriate blood volume in the arteries, capillaries, and other tissue
• **Thermal Biofeedback**
  – Change breath rate, rhythm, location and heart rate to produce desired change in peripheral and cranial blood flow
  – Effective in migraine treatment
    • Volitional control of vasoconstriction and vasodilation
• **Surface Electromyography (sEMG)**
• Monitors electrical activity of skeletal muscles to decrease tension
• Tension headaches
Relaxation Tools

• Progressive Muscle Relaxation
  – Involves tightening and releasing muscle groups to enhance awareness of tension
  – Tightening also allows for better muscle release

• Release Only
Relaxation Tools

• Imagery
  – Guided or Open-Ended
  – Use words and/or music to evoke positive imaginary scenes to produce a beneficial effect
Psychosocial Treatment

• Parents
• Address acute versus chronic mindset
  – Minimize attention to pain (questions, reassurance)
  – Attend to coping and functioning
  – Clear expectations for functioning and behavior
  – Concrete rewards for functioning
  – Removing privileges for failure to meet expectations or if child is unable to attend school
Psychosocial Treatment

• **Functional Restoration**

• Build child’s confidence in ability to engage in activities instead of focus on removing stressor or wait for pain resolution

• Return to school, social, and extracurricular functioning **despite** headaches
  – Educate schools regarding associated headache symptoms
  – Address school staff misperceptions

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Functional Restoration Cont.

- Address headaches’ impact on school work completion and focus
  - School accommodations
  - Pacing
  - Plan for gradual reintegration
School Accommodation Examples

• Encourage daily school attendance despite headache pain
• Inform teachers that student may be going to school in pain
• Allowed to carry water bottle ensure hydration
• Minimize exposure to smart boards/computers if found to be a trigger
• Have abortive medications available at school to use as needed
• Have a quiet place to lay down if needed before returning to class
Multidisciplinary Considerations in Treatment

• Medication of choice depends on associated conditions and factors
  – Mood, suicidality, attention, disordered eating?
  – Prioritize lifestyle and/or psychological contributors before prophylactic treatment?
  • High placebo effect in children and adolescents
Recommendations for Primary Care Providers

• Educate patients on the stress response to avoid stigma associated with psychosocial contributors
• Emphasize lifestyle habits and good stress management as much as medications for managing headaches
• Encourage accommodating or modifying daily activities instead of withdrawal
• Develop a psychosocial referral base
What do Children Want from Pediatricians?

- Reassurance
- Cause of Headache
- Careful Medical Evaluation
- Understand Headache Progression
What do Families Want from Pediatricians?

- Identify Headache Cause
- Reassurance
- Referral to Specialist
- Diagnostic Investigation
- Careful Medical Examination

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When to Refer

• Unable to get headaches adequately managed despite treatment
  – Headache diary is helpful to assist with visit
• If patient has seen multiple providers
• Patient/family or provider preference
• Missing school frequently due to headaches
For More Information

• www.americanheadachesociety.org – American Headache Society

• www.achenet.org – American Council for Headache Education

• www.headaches.org – National Headache Foundation
Contact Information

- Dr. Chasity Brimeyer, PhD
- Crystie Cowan, APNP, FNP-BC, PCNS-BC
  Jane B. Pettit Pain and Headache Center
  (414) 266-2775

http://www.chw.org/medical-care/pain-management-program/conditions/headache/

Physician Consultation and Referral: (800) 266-0366