

How to Discuss Treatment Options for the Adolescent Patient with Migraine

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Overview

Migraine is a chronic disease that often requires long-term therapy. While the ultimate goal is to eliminate head pain through lifestyle modifications and therapeutic interventions, this is often difficult to achieve. Setting expectations for pain control with patients and caregivers is essential for successful long-term migraine management. Discussions with patients and caregivers should highlight how the aim of therapeutic intervention is to reduce frequency and severity of migraine attacks to maximize quality of life (i.e. enable an individual to attend and participate in school, perform daily physical and social activities).

The following charts may serve as useful resources for providers to select proper treatment options, guide discussions with patients and caregivers, and provide educational materials regarding prevention and treatment strategies for adolescents with migraine.

Lifestyle Techniques

Identifying specific triggers, exacerbating and relieving factors unique to each individual is a key aspect of controlling migraine pain. The chart below outlines daily lifestyle measures in an easy to remember SMART mnemonic that may be beneficial in preventing and/or reducing frequency of migraine episodes.

SMART daily tips to help prevent or decrease frequency of migraine episodes

Sleep	<ul style="list-style-type: none">• Regular bedtime routine with consistent sleep times (even on weekends)• Limit naps• No screen time 1-2 hours before bedtime• Aim for 9-11 hours of sleep each night• If difficulty falling asleep, can use melatonin 5-10 mg to help with sleep onset (Note: should be taken 30-60 minutes before desired bedtime)
Meals (Nutrition and Hydration)	<ul style="list-style-type: none">• Consistent meals daily, no skipping meals (especially breakfast)• Snacks as needed• Aim to drink body weight equivalent in water per day (kilogram equals ounces of water)• Bring a water bottle to school to ensure consistent hydration throughout the day• If consuming high sugar electrolyte drink, dilute with half water
Activity	<ul style="list-style-type: none">• At least 30 minutes of physical activity 3-5 days per week, heart rate should be raised. May increase duration and intensity of exercise as tolerated• Limit screen time to 2 hours or less per day
Relaxation	<ul style="list-style-type: none">• Relaxation training and biofeedback programs reduce stress and/or anxiety (mindfulness apps, deep breathing techniques, yoga, etc.)• Counter-stimulation using a strong (more tolerable) stimulus during a migraine to distract from pain and break pain cycle (ex: cold ice pack to forehead or back of neck, strong mint or sour candy on tongue)
Triggers	<ul style="list-style-type: none">• Recognize and eliminate triggers including dietary, environmental, medication, physical, hormonal, behavioral (ex: specific foods, irregular meals, odors, weather changes, stress, poor sleep habits, menstrual cycle, etc.)• Keep a headache log to identify triggers and track response to above measures

Acute Therapy

Rescue medications should be used for patients with migraine (with or without aura) to stop the headache process, shorten duration, decrease severity and prevent progression of migraine symptoms including pain, nausea/vomiting and photophobia/phonophobia. These medications should be taken at the first indication of migraine, ideally within 30 minutes of onset. In addition to taking medication, resting or sleeping in a dark, quiet room if possible may be beneficial. Medication is most effective when used in combination with lifestyle modifications and proper patient education as outlined in the SMART chart above.

**Note: Severe migraine (unresponsive to medications listed below and lasting for more than 24 hours) may require intravenous infusion of medications to stop the migraine attack. Individuals should be seen by headache specialist or facility able to administer medications (infusion center, emergency department, etc).*



Acute Therapy

Over-the-counter analgesics

Medications for initial treatment of migraine (with or without aura) with mild pain and minimal disability

Medication	Mechanism of action	Dosing and frequency	Side effects	Contraindications and warnings
Nonsteroidal anti-inflammatory drugs (NSAIDs): Ibuprofen (Motrin) Naproxen (Aleve)	Inhibition of the cyclooxygenase enzymes (COX-1 or COX-2) that synthesize prostaglandins	Ibuprofen: 10 mg/kg, max dose 800mg daily limit 2400mg every 6-8 hours as needed Naproxen: 5-10mg/kg, 220mg pill strength Daily limit 660mg every 8-12 hours as needed	Indigestion Stomach pain Nausea/vomiting Headache Dizziness Drowsiness Bruising Ringing in ears	Do not use if history of renal disease, active GI bleeding or bleeding disorder Do not use more than 2 days per week to avoid rebound or medication overuse headache
Acetaminophen (Tylenol)	Weak inhibitor of the synthesis of prostaglandins	Acetaminophen: 15 mg/kg, max dose 1 gram daily limit 4 grams every 4-6 hours as needed	Hepatotoxicity Anaphylaxis Skin reactions	Do not use with liver disease or failure Do not use more than 2 days per week to avoid rebound or medication overuse headache

Gepants

Medications for moderate to severe migraine (with or without aura) refractory to or contraindicated usage of triptans

Medication	Mechanism of action	Dosing and frequency	Side effects	Contraindications and warnings
Ubrogepant (Ubrelvy) Rimegepant (Nurtec)	CGRP receptor antagonists	Ubrelvy: 50 or 100 mg dose max dose 200mg/24hr Nurtec: 5 mg single dose max dose 75 mg/24hr	Nausea Drowsiness Dry mouth	Do not use with strong CYP3A4 inhibitors (e.g., ketoconazole, itraconazole, clarithromycin)

Anti-emetics

Medications for nausea and/or vomiting with migraine (with or without aura) to be used in combination with analgesics

Medication	Mechanism of action	Dosing and frequency	Side effects	Contraindications and warnings
Ondansetron (Zofran) Promethazine (Phenergan)	5-HT ₃ receptor antagonist Dopamine receptor and H1 receptor antagonist	Ondansetron: 4 or 8 mg per dose max dose 24mg/24hr every 8-12 hours as needed Promethazine: 0.25-0.5 mg/kg/dose max dose 100mg/24hr every 4-6 hours as needed	Dizziness Drowsiness Headache Paradoxical effects- excitability restlessness	Avoid if taking other QT interval prolonging agents Avoid if taking other QT interval prolonging agents or if known hypersensitivity to promethazine

Acute Therapy

Triptans

Medications for moderate to severe migraine (with or without aura) refractory to analgesics

Medication	Mechanism of action	Dosing and frequency	Side effects	Contraindications and warnings
Rizatriptan (Maxalt)	Serotonin agonists with an affinity for 5-HT _{1B/1D} receptors	Rizatriptan: 6-17yr oral 5mg (<40kg), 10mg (>40kg) daily limit 30mg	Dizziness Fatigue Dry mouth Nausea/vomiting	Do not use if history of ischemic vascular disease, cerebral vascular abnormalities, arrhythmias associated with accessory conduction pathway disorders or pregnancy Triptans should not be used in combination with ergotamines Use with caution in patients with hemiplegic or brainstem aura, theoretical risk of vasospasm For Rizatriptan, if taking propranolol should reduce dose to 5mg To prevent the development of medication overuse headache, do not use more than nine days per month
Sumatriptan (Imitrex)		Sumatriptan: 12-17yr oral 25mg (<40kg), 50-100mg (>40kg) daily limit 200mg	Numbness	
Zolmitriptan (Zomig)		nasal 5mg (<40kg), 10-20mg (>40kg) daily limit 40mg	Tingling Weakness Pain/pressure Flushing	
Almotriptan (Axert)		Zolmitriptan: 12-17yr oral or nasal		
Eletriptan (Relpax)		2.5mg (<40 kg), 5mg (>40kg) daily limit 10mg		
Frovatriptan (Frova)		Almotriptan: 12-17yr oral 6.25mg (<40kg), 12.5mg (>40kg) daily limit 25mg		
Naratriptan (Amerge)		Eletriptan: 12-17yr oral 20mg (<40kg), 40-80mg (>40kg) daily limit 80mg		
Sumatriptan-naproxen (Treximet)		Frovatriptan: 12-17yr oral 2.5mg daily limit 7.5mg		
		Naratriptan: 12-17yr oral 1 or 2.5mg daily limit 5mg		
		Treximet: 12-17yr oral 10/60, 30/180 or 85/500mg daily limit 85/500mg		

Anti-histamines

Medications to induce sleep with migraine (with or without aura) to be used in combination with analgesics

Medication	Mechanism of action	Dosing and frequency	Side effects	Contraindications and warnings
Diphenhydramine (Benadryl)	Histamine H ₁ Antagonist	Diphenhydramine: 6.25 or 12.5 mg per dose max 6 doses/24hr every 4 hours as needed	Drowsiness Dizziness Tremor Headache Stomach upset	Avoid use in patients with overactive thyroid, increased eye pressure or previous hypersensitivity reaction

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Preventive Therapy

For frequent headaches, especially chronic daily headaches (defined as >15 headache days per month), preventive therapies should be tried, in addition to lifestyle modification, co-morbidity management and cognitive behavioral therapy. The goal of these medications is to reduce headache frequency and/or severity and to reduce headache-related functional disability. Historically, the medications used were those known to be effective in reducing headache frequency in adults. In 2013, the findings of the Childhood Headache and Migraine Prevention (CHAMP) trial, which compared the use of topiramate and amitriptyline to placebo over the course of a 24-week treatment period, found no significant difference in reduction of headache frequency or headache-related disability across the 3 groups¹. The study was stopped early due to futility and the active drugs were

associated with increased adverse events. The medications listed below are those commonly used to help with reducing headache burden in children and adolescents. Much of their use has been extrapolated from studies in adults. Specific medications are often selected based on their potential benefit and/or (positive or negative) side effects and an individual patient's co-morbidities. The lack of evidence supporting pharmacologic therapy and significant placebo effect noted in pediatric migraine studies should be discussed with patients and families prior to any medication trial. Overuse of over the counter or prescribed rescue medications should be addressed. Long term data on the use of CGRP modulators is not yet available. As such, these medications should be used in carefully selected patients with close clinical monitoring².

Preventive Treatments

Medications to reduce the frequency and/or severity of chronic daily headache

Medication	Mechanism of action	Dosing and frequency	Side effects	Contraindications and warnings
Cyproheptadine (Periactin) 4 mg tablets 2 mg/5 mL syrup	Antihistamine (H ₁ antagonist) and serotonin antagonist with anticholinergic effects	0.2-0.4 mg/kg/day; range 2-8 mg at bedtime	Sedation, increased appetite, weight gain	
Topiramate (Topamax) 15 mg and 25 mg sprinkle capsules 25 mg, 50 mg, 100 mg & 200 mg tablets	Sodium channel blocker, GABA agonist, glutamate antagonist, weak carbonic anhydrase inhibitor	6 to <12y, weight > 20 kg: begin with 15 mg daily and gradually increase weekly up to max of 2-3 mg/kg/day or 100 mg/day ≥12y: begin with 25 mg daily and increase weekly up to 100-200 mg/day; must taper slowly	Flushing, decreased appetite/weight loss, reduced sweating, kidney stones, cognitive slowing, dizziness, paresthesias, fatigue	May cause fetal harm
Amitriptyline 10 mg, 25 mg, 50 mg, 75 mg, 100 mg & 150 mg tablets	Tricyclic antidepressant - serotonin & norepinephrine reuptake inhibitor	Tricyclic antidepressant - serotonin & norepinephrine reuptake inhibitor	Sedation, dry mouth, dizziness, constipation, urinary retention	Increased risk of suicidal thinking and behavior, prolonged QT (obtain ECG if dosing >1 mg/kg/day)
Propranolol 20 mg/5mL & 40 mg/5 mL solutions 10 mg, 20 mg, 40 mg and 80 mg tablets Extended release also available	Non-selective beta-adrenergic blocker	Children 3 years and adolescents: 0.5-3 mg/kg/day divided BID or TID, max 20-40 mg TID; must taper slowly	Fatigue, exercise intolerance, bradycardia, hypotension, bronchospasm	Do not use in patients with heart block or asthma

Preventive Treatments

Medications to reduce the frequency and/or severity of chronic daily headache

Medication	Mechanism of action	Dosing and frequency	Side effects	Contraindications and warnings
Verapamil 40 mg, 80 mg and 120 mg tablets Controlled and extended release also available	Calcium channel blocker	40-120 mg/day divided	Constipation, gingival hyperplasia, hypotension, dizziness, elevated transaminases	Can cause heart block
Valproic Acid (Divalproex sodium/Depakote/Depakene) 250 mg/5mL solution 125 mg and 250 mg sprinkle capsules Extended release also available Extended release also available	GABA-agonist, sodium channel blocker	10-15 mg/kg/day divided BID, dose range 250-1,000 mg/day; must monitor CBC, LFTs, vitamin D	Alopecia, hepatotoxicity, hyperammonemia, encephalopathy, leukopenia, thrombocytopenia, drug hypersensitivity, suicidal thoughts/behavior	FDA black box warning for fetal risk and hepatic failure; pancreatitis
CGRP modulators Erenumab (Aimovig) Fremanezumab (Ajovy) Galcanezumab (Emgality) Eptinezumab	Calcitonin Gene-Related Peptide (CGRP) Receptor Antagonist	70-140 mg SC monthly 225-625 mg SC q3 months 120-240 mg SC monthly 100-300 mg IV q3 months	Injection site reaction, constipation, muscle cramps/spasms Eptinezumab only: URI, hypersensitivity, fatigue	High cost, lack of long term data, may be beneficial for patients not able to take daily medications
Onabotulinum toxin A (Botox)	Prevents calcium-dependent release of acetylcholine	74-155 Units IM q3 months (5U/site over 31 sites covering forehead, scalp and posterior cervical region)		Spread to other areas, causing weakness, diplopia, ptosis, dysphagia, dysphonia, dysarthria and difficulty breathing
Supplements Magnesium Co-enzyme Q10 Riboflavin (B2) Melatonin	Mitochondrial cofactor, NMDA-glutamate receptor antagonist CoQ10 and B2 are both mitochondrial enzymatic cofactors Supplements endogenous melatonin to promote sleep onset	20-80 mEq of elemental magnesium /day CoQ10: 1-3 mg/kg/day (up to 100 mg TID) Riboflavin: 25-400 mg daily 1-5 mg at bedtime	Diarrhea Discoloration of urine, GI upset Vivid dreams	

Preventive Treatments

Medications to reduce the frequency and/or severity of chronic daily headache

Medication	Mechanism of action	Dosing and frequency	Side effects	Contraindications and warnings
Non-invasive Neuro-modulatory Devices	Transcutaneous supraorbital neurostimulation applied to forehead	20 minutes daily 4 pulses BID	Fatigue, headache, skin irritation	
Cefaly (tSNS)		2 minutes TID	Momentary light headedness, tinnitus	
eNeura (sTMS)	Single pulse transmagnetic stimulation to the back of the head		Site-related discomfort/tingling, dizziness	
Gamma Core	Non-invasive vagus nerve stimulation to the side of the neck, blocks pain signals			

References/Resources:

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