

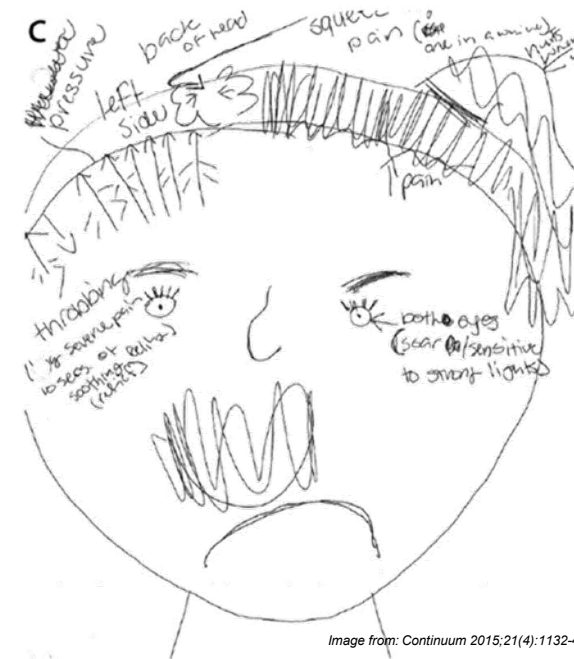


Image from: Continuum 2015;21(4):1132-45.

Headache in Kids & Teens

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Disclosures



Serena Orr

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- **Other:** Royalties from Cambridge University Press for book publication; associate editor of Headache, Neurology, and the American Migraine Foundation

Marissa Lagman

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- **Advisory Board:** TEVA, Lundbeck, Searchlight, Pfizer
- **Patents:** None
- **Other:** Royalties as an author from Canadian Pharmacists Association



Learning Objectives



Upon completion of this activity, learners will be able to:

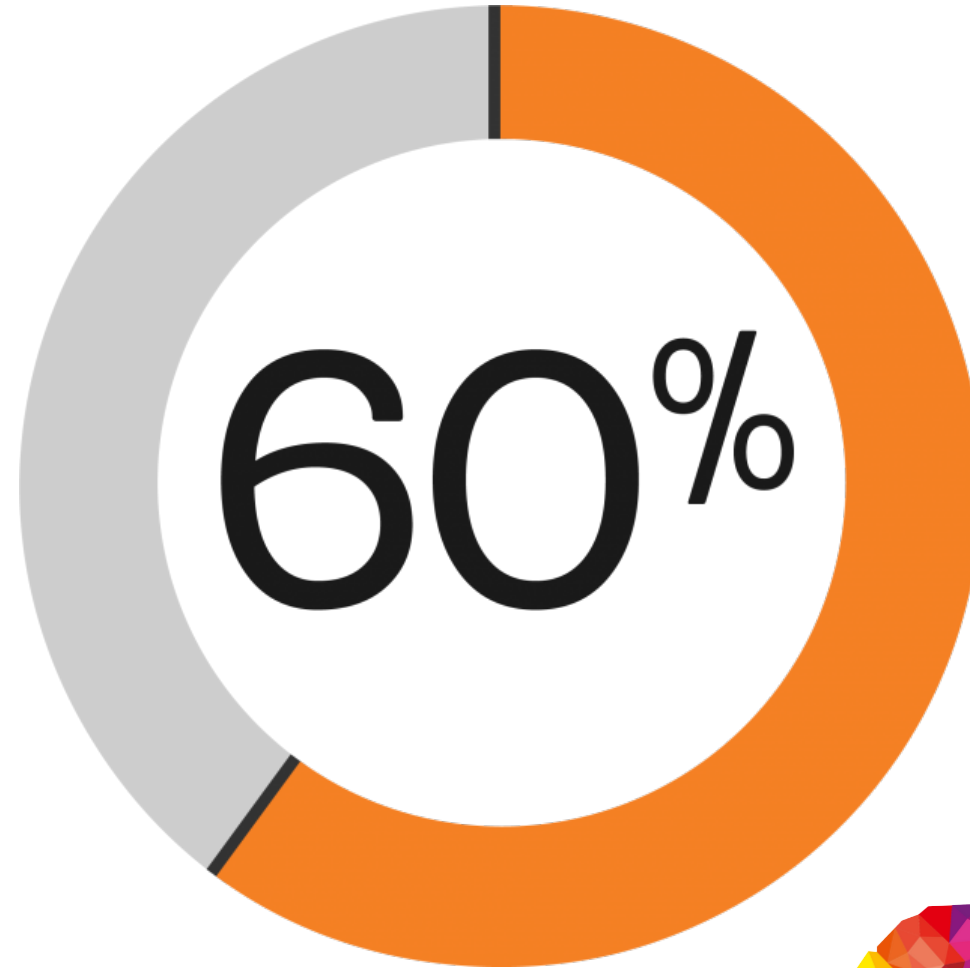
- Outline the prevalence & burden of disease of headache disorders in youth
- Describe the epidemiology of headache disorders in youth
 - Age of presentation
 - Sex and gender data
 - Geographic variability
 - Other demographic data
- Implement an approach in evaluation and diagnosis of pediatric headache
- Consider management strategies for common pediatric primary headache disorders with focus on migraine



Prevalence



8-30% have frequent
recurrent headaches
(≥ 1 /week)



Kröner-Herwig B et al. Cephalalgia. 2007;27(6):519-527; Torres-Ferrus M et al. Cephalalgia. 2019;39(1):91-99; Image from: princeton.edu/news



Prevalence



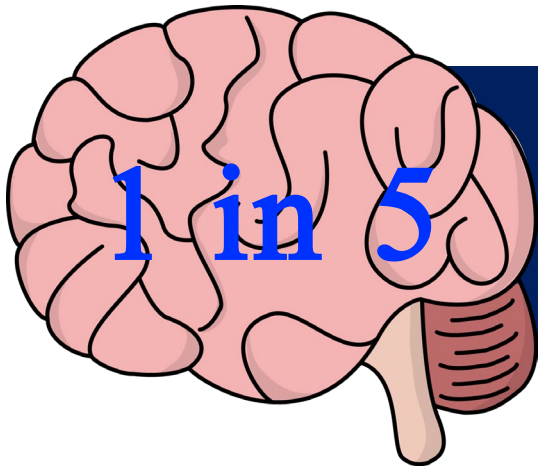
Migraine = 50-88%
of headache cases in
pediatric neurology



Curless RG. Pediatr Neurol 1998;19(4):272-274; Martínez Menéndez B et al. Neurología 2016;31(9):606-612; Pedraza MI et al. Neurología 2015;30(4):208-213; Raieli V et al. J Child Neurol 2015;30(2):182-186; Images from: Bing AI Image Creator & canva.com



Tension-Type Headache

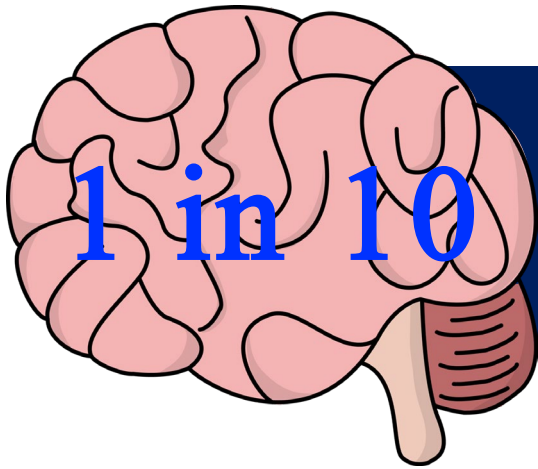


~1 in 5 children and adolescents experience TTH

Onofri A et al. J Headache Pain 2023;24(1):8.



Migraine



~1 in 10 children and adolescents experience migraine

Onofri A et al. J Headache Pain 2023;24(1):8; Abu-Arafeh I et al. Dev Med Child Neurol 2010;52(12):1088-97; Orr SL et al. CJNS 2017;44(1)

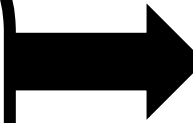


Burden of Migraine in Youth



2021 Global burden of disorders affecting the nervous system: Top 10 causes of global YLD* in age 5-19 years

- Migraine is the **#1 most disabling neurological disorder** globally in children & adolescents¹
- QOL of youth with migraine= **rheumatoid arthritis or cancer**²



1. **MIGRAINE**

2. Preterm birth

3. Epilepsy

4. Autism Spectrum Disorder

5. Meningitis

6. Stroke

7. Idiopathic Intellectual Disability

8. Neonatal Encephalopathy

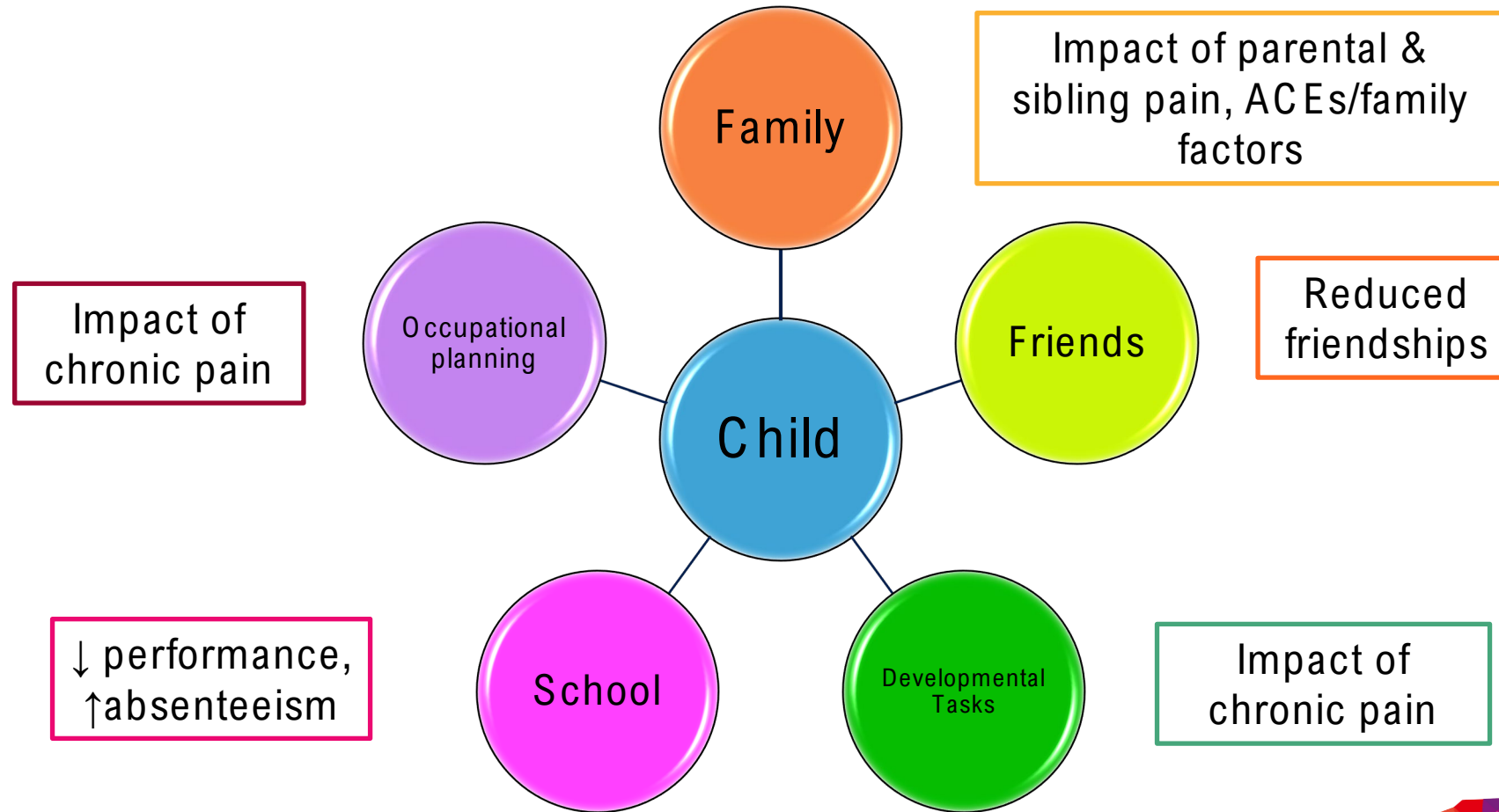
9. Other Neurological Disorders

10. Nervous System Cancer

1. GBD 2021 Nervous System Disorders Collaborators. *Lancet Neurology*. 2024 Apr;23(4):344-381

2. Antonaci F, et al, *The Journal of Headache and Pain*, 2014; 15:15

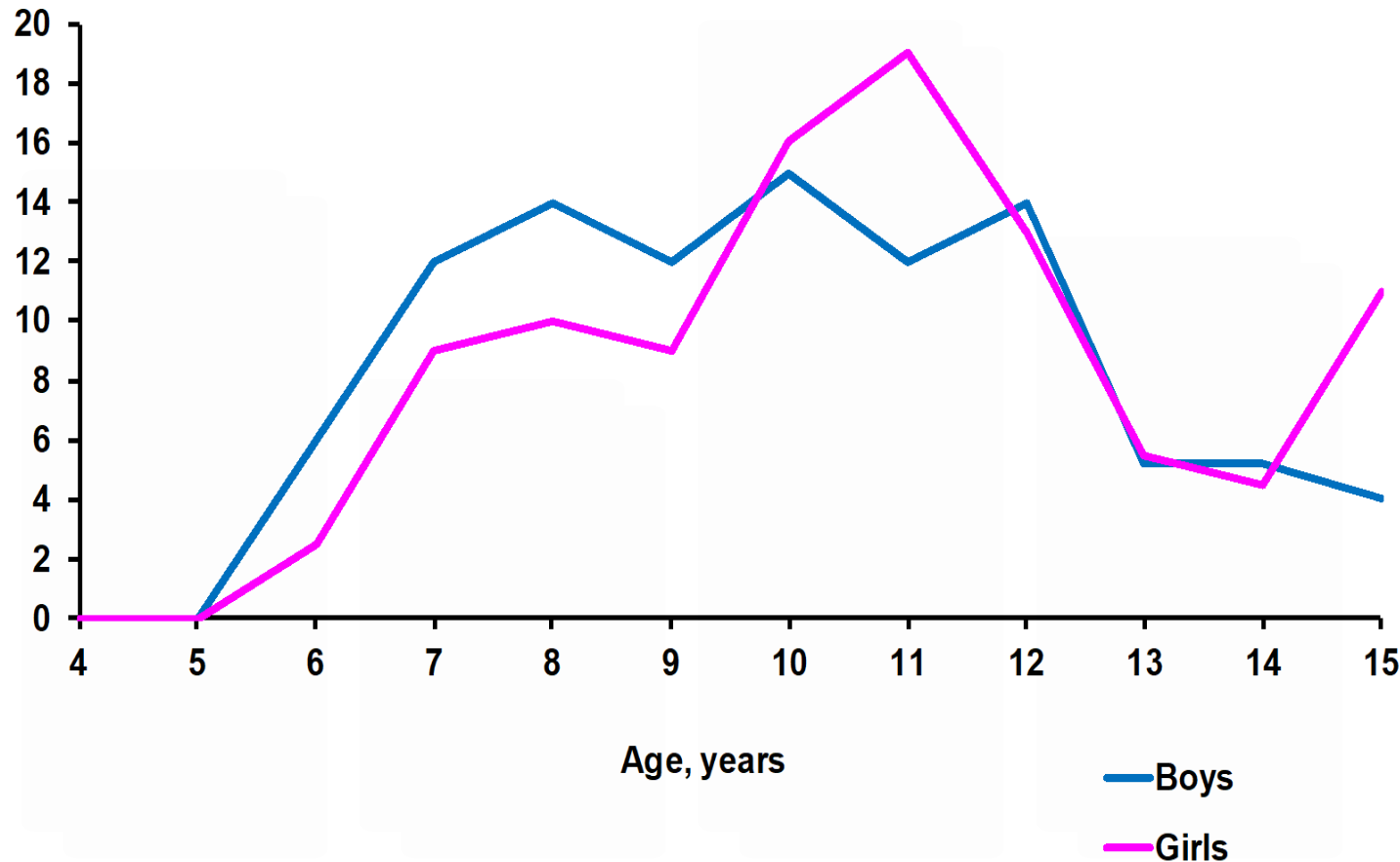
Multidimensional burden



How Common is Migraine in Kids and Teens?



Migraine prevalence, %



Mean age of onset

Boys: 7.2 years

Girls: 10.9 years

Gender

< 12 years: slight preponderance of boys

≥ 12 years: incidence increases in females (F:M=3:1)

Early diagnosis



Faster Dx/Rx =

1. @ 6-yr follow-up: ↑ rate of headache free x 12 months
2. @ 10-yr follow-up: ↓ likely ongoing migraine



*Galinski M et al. Pediatr Neurol 2015;53(4):319–23; Kienbacher C et al. Cephalalgia 2006;26(7):820–30;
image from: canva.com.*





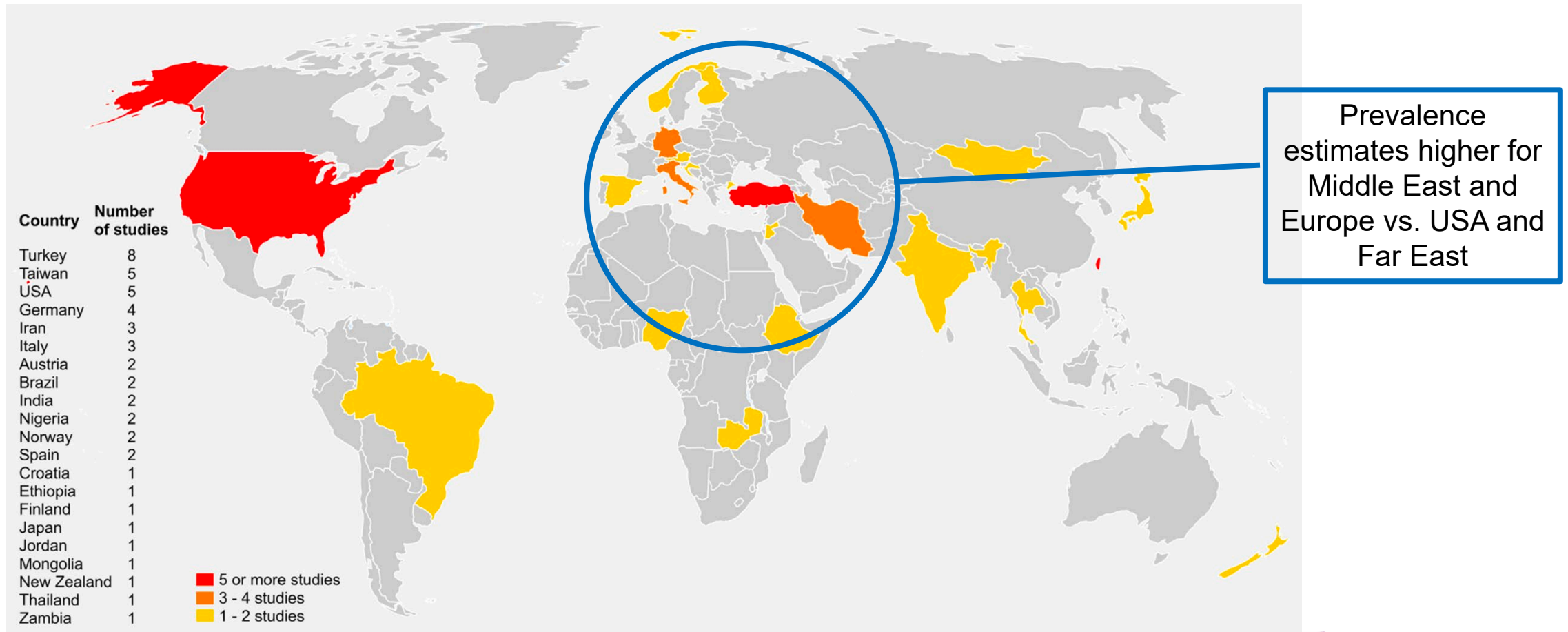
Gender diversity in youth

- 3.3 x higher odds of frequent recurrent headaches
- Association nullified after control for bullying and mental health



Nilles C et al. Neurology 2023;101:e1654-64; Hranilovich JA et al. Headache 2021;61:1040-50; Rosendale N et al. Neurology 2022;99(14):e1549-59; image from: canva.com

Geography



Onofri A et al. J Headache Pain 2023;24(1):8; Abu-Arafeh I et al. Dev Med Child Neurol 2010;52(12):1088–97



Race and Care



- Black people & men less likely to access diagnosis
- White youth more likely to get Rx for acute medications



Nicholson RA et al. Headache 2006;46(5):754-65; Lipton RB et al. Headache 2013;53(1):81-92; Seng E et al. Cephalalgia 2019;39(8):1000-1009.



SES and Care



- Higher SES associated with
 - Higher consultation & diagnosis rates in adults
 - Higher prevalence of triptan Rx in adults
 - Higher likelihood of admission to hospital in youth



Lipton RB et al. Headache 2013;53(1):81-92; Chu MK et al. Headache 2012;52(2):213-223; Recober A et al. Pediatr Neurol 2019;91:34-40; image from: canva.com.



CASE: Lucy



- You are seeing a 14-year-old girl in your clinic presenting with intermittent headaches.

Detailed history and examination is the key!



Image from: vecteezy.com



Headache “**RED**” Flags in Children: SNOOP⁸-Y



S	Systemic signs or symptoms	Fever, weight loss, vomiting, comorbidities, malignancy, rash, meningeal signs, neurocutaneous lesions (i.e., NF, tuberous sclerosis), history of head injury, medications; new headache in immunosuppressed child
N	Neurologic signs or symptoms	Abnormal neurologic examination: papilledema, ataxia, focal neurologic deficits (paralysis), altered level of consciousness (confusion) abnormal gait, changes in personality/behavior, cognition, new onset seizures, vertigo
O	Onset sudden	Sudden, “worst headache of life” (thunderclap)
O	Onset in sleep/early morning	Headache waking the child from sleep or early morning pattern (intracranial lesions, sleep apnea, sleep disorders, diurnal pattern in primary headache disorders)
P⁸	Pattern change Progressive course or new Precipitated by valsalva Positional exacerbation Parents (lack of family history) Pregnancy (Adolescents) Presentation (atypical) Post-traumatic onset	Pattern change: quality, frequency, or location, persistent daily headache (steadily worsening pattern) Precipitated by coughing, sneezing, exercise, Valsalva Positional Pregnancy: adolescent turns to child-bearing age Presentation is atypical with intractable vomiting, recent onset <6 months Parents: lack of family history Post-injury
Y	Younger	New headache ≤ 5 yrs old

©Lagman and Lay

Tips in Taking Headache History in Children

Have the child sit closest to you
Talk to the child to get history

- < 6 yo: draw a picture
- signs and symptoms: inferred in their behavior

Look for clues in
patient's history

- Family history of migraine
- Episodic syndromes associated with migraine

Screen for
comorbidities

- Depression, anxiety, obesity, suicidal ideation
- Adverse childhood experience (ACE)



Gelfand, A. Pediatric and Adolescent Headache Continuum (Minneapolis, Minn). 2018; 24(4, Headache): 1108-1136
Staflstrom CE, Rostasy K, Minster A. Pediatrics. 2002; 109; 460-472
<https://www.hopkinsmedicine.org/news/articles/an-artful-diagnosis-of-headache-in-young-children>

What Questions Do you Want to Ask Her?



Define specific aspects of patient's headache LEVEL B

Prior to onset
of headache

- prodromal symptoms
- aura (visual, sensory, speech)

Headache
semiology

- onset, location, quality, severity
- frequency, duration
- aggravating and alleviating factors

Associated
symptoms
& others

- nausea, vomiting, phonophobia, photophobia
- migraine-related disability
- patterns of headache & triggers
- medications: previous therapies (outcome), overuse

Oskoui M, et al. AAN/AHS Guideline, Neurology, 2019, 93:487-499



Look for Clues in Your Examination

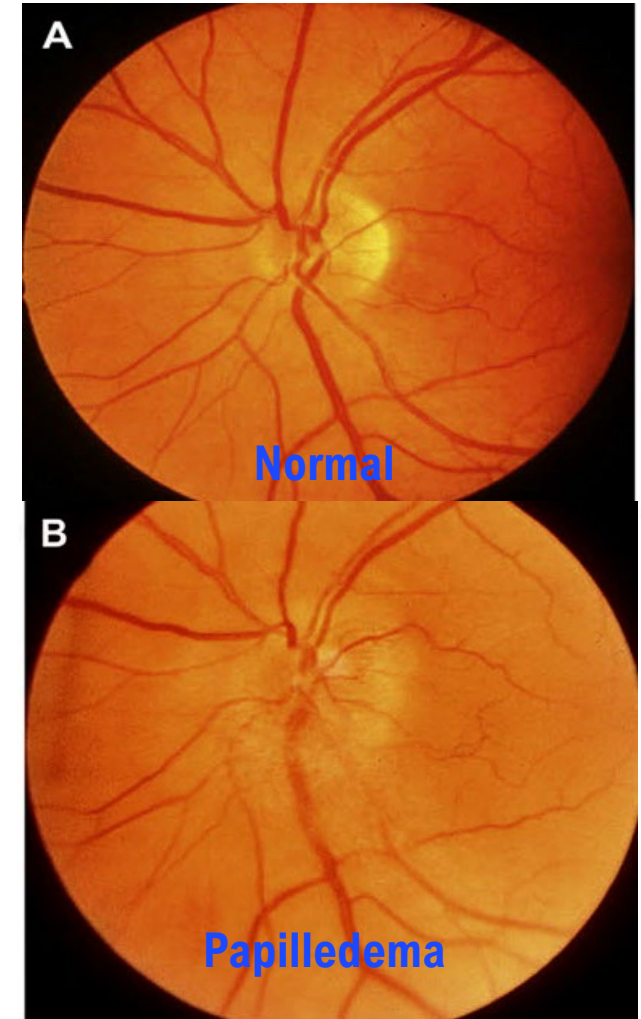
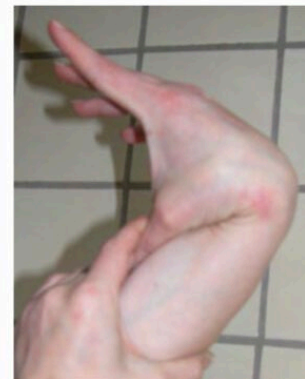


- Systemic Examination

- Vital signs
- Skin changes
- Bruits (orbital, carotid, temporal)
- MSK: hypermobility

- Neurological Examination

- Mental status exam
- Cranial nerve deficits
- **Fundoscopy**
- Motor and sensory deficits



<https://back-in-action.com/uncategorised/hypermobility-beighton-score>

When to Worry? When to Scan?



- Neuroimaging is NOT indicated in children with recurrent headaches + normal neurologic exam: **Level B**^{1,2}
- Consider: **+ RED** flags
 - **Abnormal neurologic exam: Level B**^{1,2}
 - Papilledema, decreased level of consciousness, motor deficits³, ataxia⁴: strong PPV for significant pathologic findings
 - History: blurry vision, recent onset of severe headaches, change in type of headaches → **Level B**^{1,2}

1. Lewis D, Ashwal G, et al, *Neurology* 2002;59:490-498

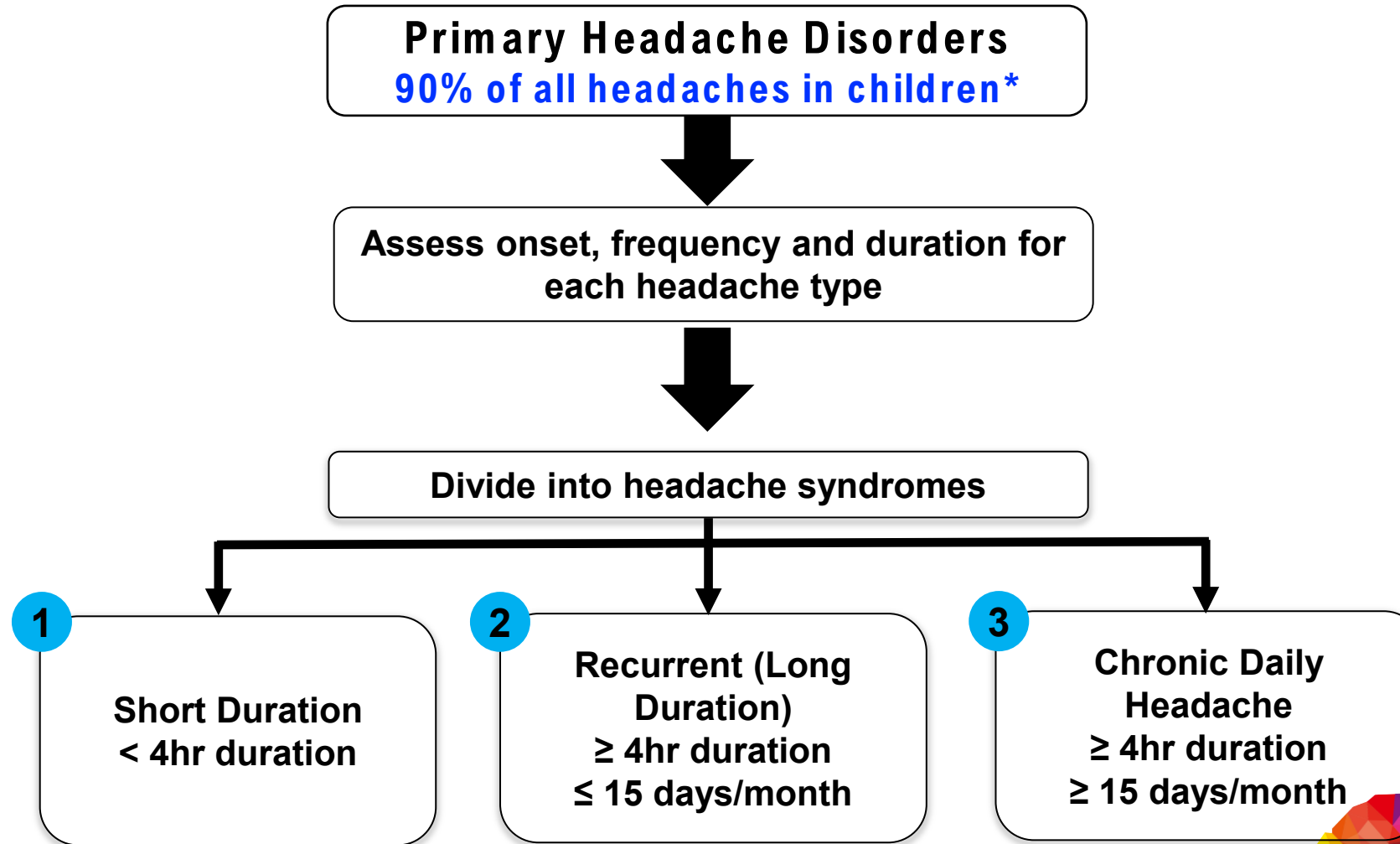
2. Lewis D, Koch T, *Pediatric Annals*, 2010; 39:399-406

3. Trofimova A, Vey BL, Mullins ME, et al..*AJR*.2018;210:8-17

4. Rho YI, Chung HJ, Suh ES, et al., *Headache* 2011;51:403-408



Categorize into 1 of 3 groups



**Gofshteyn and Stephenson, Curr Probl Ped Adol Health Care.2016;46:36-51*



**CANADIAN
HEADACHE
CONFERENCE**
COAST TO COAST

Primary Headache Disorders



1

Short Duration
< 4hr duration

- Tension type headache (10-24%)
- Migraine (3.2-14.5%)
- Primary stabbing headache (3-12% in <6yo)
- Primary exertion related headache
- Trigeminal autonomic cephalalgia
 - Cluster headache (0-1%; 5-10% start in adolescence) *
 - Paroxysmal hemicrania (0.02-0.8%)
 - Short-lasting unilateral neuralgiform headache attacks with conjunctival injection and tearing (SUNCT) (rare, case reports)
- Trigeminal neuralgia (1-1.5%)
- Primary hypnic headache (5 cases)

2

Recurrent (Long
Duration) ≥ 4hr duration
≤ 15 days/month

- Tension type headache
- Migraine
- Primary hypnic headache

3

Chronic Daily Headache (1-2%)
≥ 4hr duration
≥ 15 days/month

- Chronic tension-type headache (5%)
- Chronic migraine (1.75%; 69 % in specialty clinics) **
- New daily persistent headache (13-35% of children with CDH) ***
- Chronic cluster headache
- Chronic paroxysmal hemicrania (9 cases)***
- Hemicrania continua (rare)
- Nummular headache (rare)

*Antonaci F, et al, J Headache and Pain. 2014;15:15

**Powers S, et al. JAMA, 2013;310(24):2622-2630

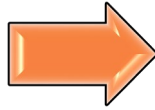
***Baron EP, Rothner AD. Curr Neurol Neuroscience Report, 2010;10:127-132

CASE: Lucy



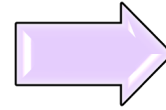
Headache features

- 2-3 days a week (2-10 hours)
- Bifrontal moderate to severe pressure pain
- bright lights, loud noise, strong smells bother her, +/- nausea
- prefers to rest



Past & Family History

- depression, anxiety, infant colic
- Medications: acetaminophen & ibuprofen (stopped working)
- Mother: headaches during menses



Examination

- Vital signs: stable
- Systemic & neuro exam: unremarkable

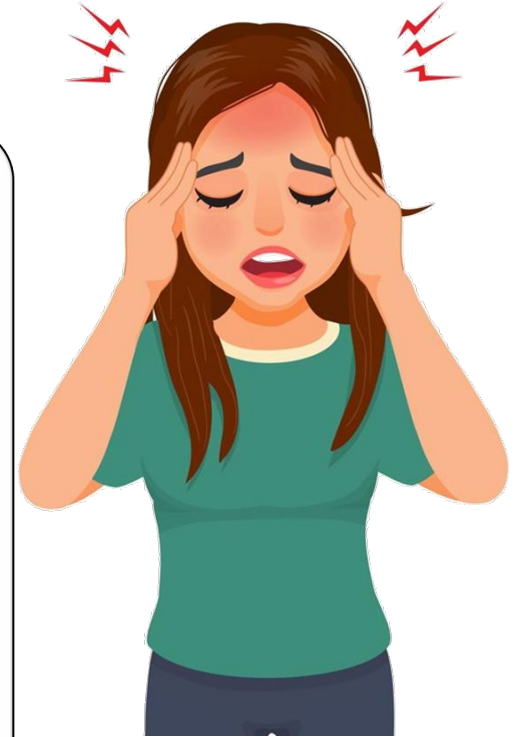


Image from: vecteezy.com



**CANADIAN
HEADACHE
CONFERENCE**
COAST TO COAST

Does She Have Tension-Type Headache?



Features	Patient	Migraine	Tension Type Headache
Duration of attack	2-10 hours	2-72 hours	30 mins to 7 days
Pain Characteristics			
Location	Bilateral	Unilateral (~80% bilateral, frontal)	Bilateral (always)
Quality	Pressure	Throbbing (~60% non-throbbing)	Non-throbbing
Intensity of pain	Moderate to severe	Moderate to severe	Mild (occasionally moderate)
Worsening with activity	YES	YES	NO
Associated Features			
Nausea and Vomiting	YES (nausea)	YES	NO
Photophobia/Phonophobia	Both	Both	Either

IHS, ICHD-3, Cephalalgia, 2018, Vol. 38(1) 1-211

Baglioni V, et al. Life, 2023, 13(3), 825; <https://doi.org/10.3390/life13030825>

Treatment of pediatric TTH ¹

1st line:

Lifestyle modifications, headache education

2nd line: non-pharmacologic therapies
Behavior therapies: relaxation, biofeedback, CBT, stress management, mindfulness and sensory training

3rd line: pharmacologic therapies

ACUTE:

Acetaminophen

Ibuprofen

PREVENTIVE: no clear recommendations

Amitriptyline (1st choice): 1 mg/kg/day

Valproate: 10-20 mg/kg/day

Magnesium: 200-300 mg BID

How Is Migraine In Children Different From Adults?

Migraine is an episodic headache lasting 4-72 hrs with:
(2-72 hours in children)

Any 2

- ☐ unilateral (starts in adolescence but often bilateral in younger children)
- ☐ throbbing (often non-throbbing in children)
- ☐ worsened by activity
- ☐ moderate or severe

2+1 = Migraine

Any 1

- ☐ **nausea or vomiting**
- ☐ photophobia and phonophobia (often inferred from behavior in children)
- ☐ At least 5 attacks
- ☐ Not due to other disorder



Back to Our Case...



- How would you treat her headaches?

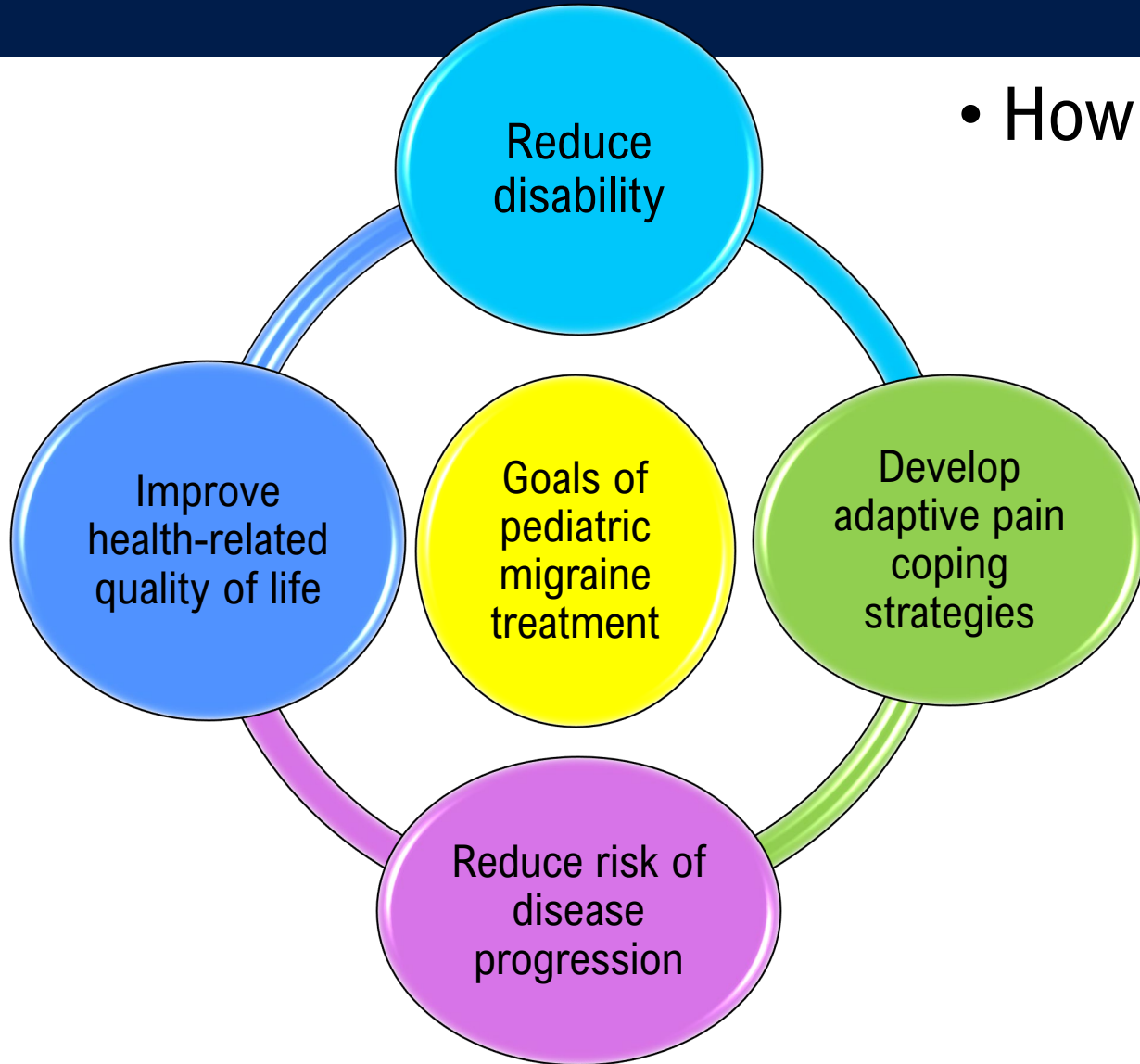
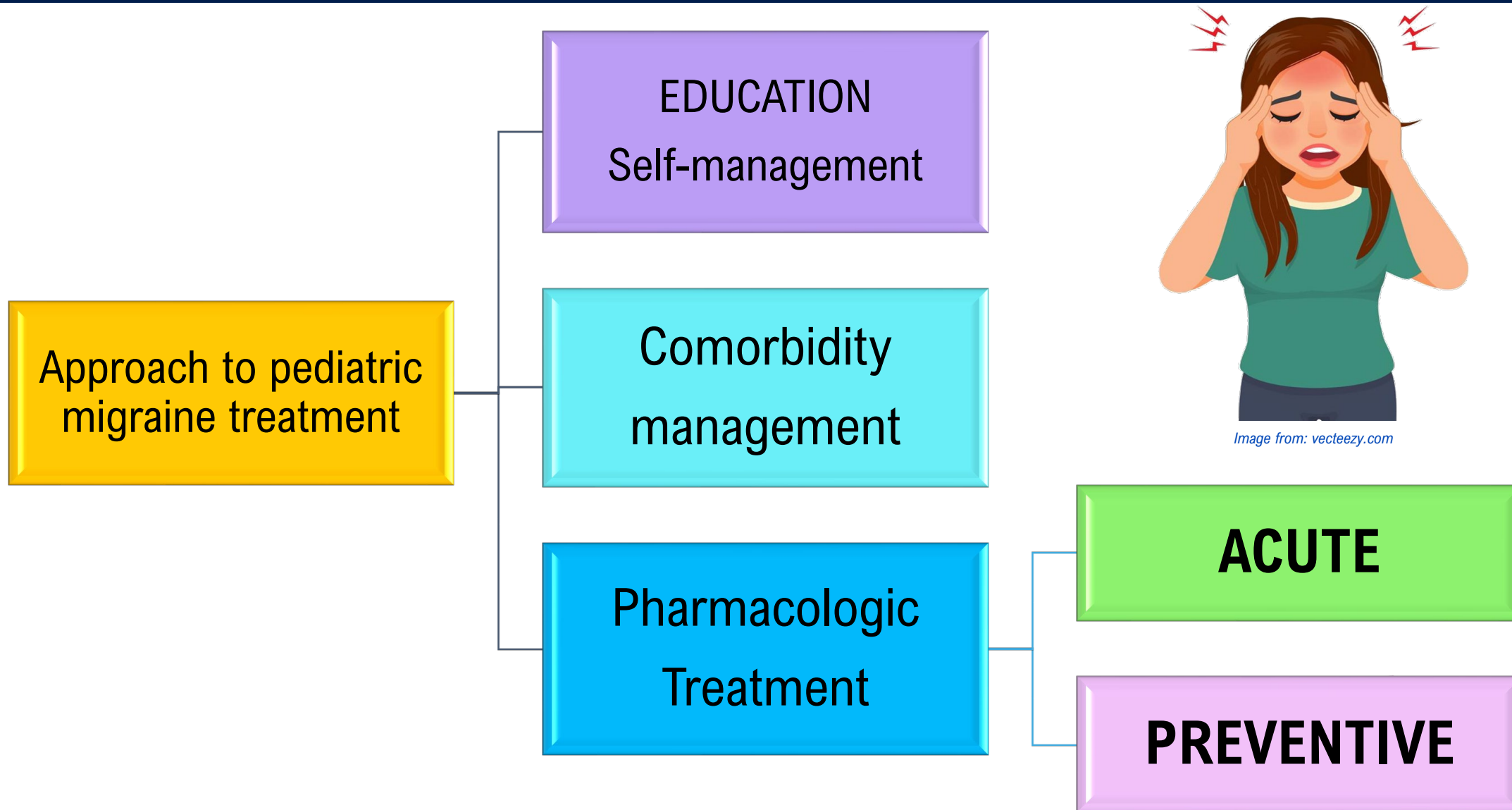


Image from: vecteezy.com

Orr SL, Kabbouche MA, O'Brien H, et al. Nature Reviews Neurology. 2018; 14:515-527



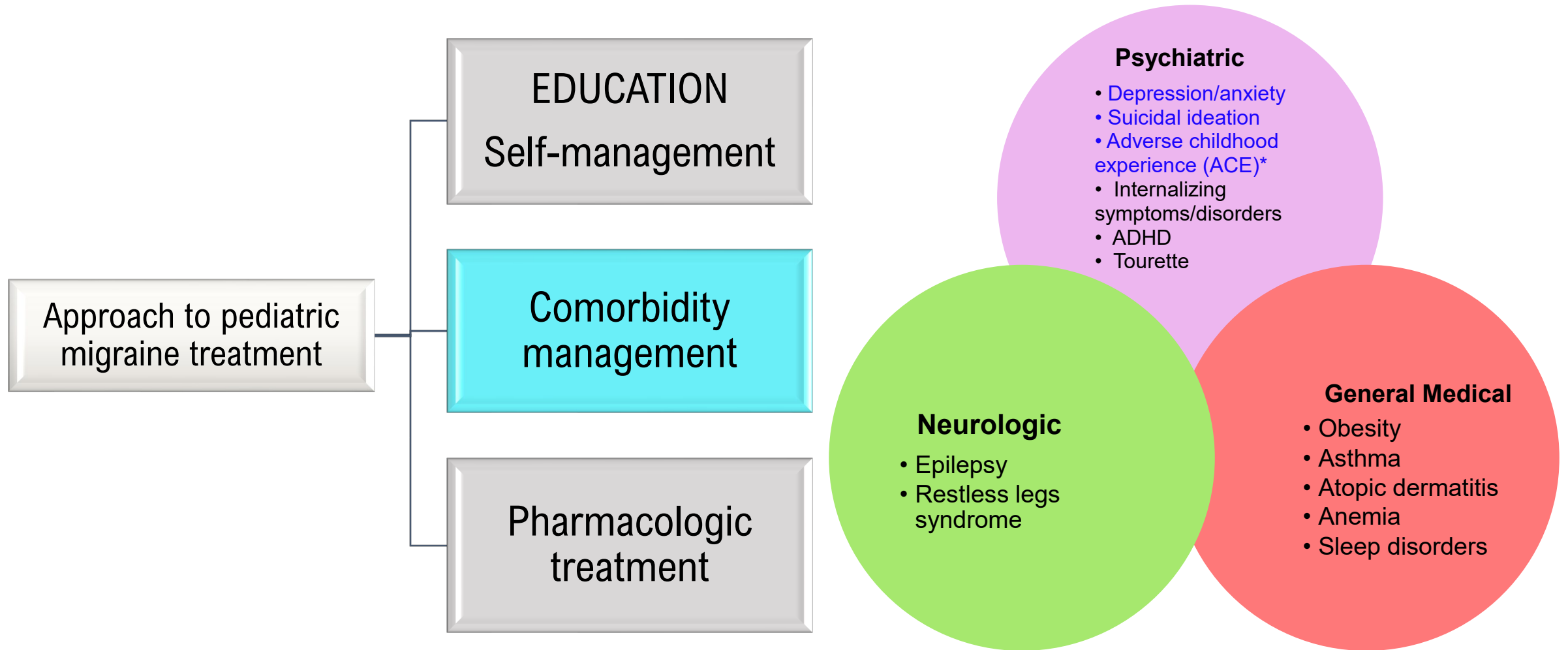


SHARED: Lifestyle Changes to Promote Headache Health



Headaches in Kids and Teens: SHARED Model of Care	
S upplements	Magnesium citrate (9 mg/kg/day): 150-450 mg/day Coenzyme Q10 (1-3 mg/kg/day): 100-200 mg/day
S creen time	Screen exposure (high level >4 hours/day): may trigger migraine, negatively impacts sleep Screen overuse >2 hours/day: linked to mood and anxiety symptoms, decreases activity level
H ydration	Increase water (up to 2-2.5L/day, limit caffeinated drinks, no energy drinks, avoid sugary drinks)
H eadache diary	Use headache diary to identify triggers , headache pattern, response to treatment (Level C)
A ctivity and A void triggers	Out everyday, socialize (face to face)/school, physiotherapy, limit screen/computer activity Activity should be regular and appropriate Identify, prevent and avoid triggers
R outine sleep	Regular sleep and wake time, avoid naps
E ating	NO skipped meals, high protein for breakfast, whole>frozen>canned food, monitor foods which can trigger headaches (MSG, caffeine, alcohol, cured and preserved meats, aspartame)
D owntime	Stress management and relaxation (CBT , mindfulness, biofeedback therapy)

Modified, Monsour D, Lay C, Ansari T, Lagman-Bartolome AM, Curr Neurol Neuroscie Rep, 2020; 20:53



Rescue Therapies You Can Consider

Non-specific treatment of migraine attacks

NSAID: Ibuprofen (Level B)

TREATMENT	DOSAGE	INTERVAL	MAXIMUM
Ibuprofen	10 mg/kg/dose	q6-8h prn	600 mg/dose, 40 mg/kg/day or 2400 mg/day
Naproxen	5-7 mg/kg/dose	q8-12h prn	500 mg/dose, 10 mg/kg/day or 1000 mg/day
Acetaminophen	15 mg/kg/dose	q4-6h prn	1000 mg/dose, 75 mg/kg/day or 4000 mg/day

Specific treatment of migraine attacks for patients

Triptans (Level B)

TREATMENT	DOSAGE	INTERVAL	MAXIMUM	
Rizatriptan Tablets & ODT	< 40 kg: 5 mg ≥ 40 kg: 10 mg	Can repeat in 2 hours, max 2 doses/24 hours	< 40 kg: 10 mg ≥ 40 kg: 20 mg	5 mg ODT approved by FDA for ≥ 6 yo
Zolmitriptan Tablets, ODT & nasal spray	< 40 kg: 2.5 mg PO ≥ 40 kg: 5 mg PO	Can repeat in 2 hours, max 2 doses/24 hours	< 40 kg: 5 mg ≥ 40 kg: 10 mg	2.5 mg nasal spray approved by FDA for ≥ 12 yo
Sumatriptan nasal spray	< 40 kg: 5 mg ≥ 40 kg: 20 mg	Can repeat in 2 hours, max 2 doses/24 hours	< 40 kg: 10 mg ≥ 40 kg: 40 mg	10 mg nasal spray approved by European Medicines Agency for ≥ 12 yo
Almotriptan	< 40 kg: 6.25 mg PO ≥ 40 kg: 12.5 mg PO	Can repeat in 2 hours, max 2 doses/24 hours	< 40 kg: 12.5 mg ≥ 40 kg: 25 mg	6.25 mg and 12.5 mg tablets approved by Health Canada and FDA for ≥ 12 yo
Sumatriptan/Naproxen combined tablet	< 40 kg: Do not use due to the 500mg naproxen dose which is too high ≥ 40 kg: 85mg Sumatriptan/500 mg Naproxen once per day			85/500 mg tablets approved by FDA for ≥ 12 yo

Anti-nausea medication

Anti-emetics (Level B)

TREATMENT	DOSAGE	INTERVAL	MAXIMUM
Ondansetron liquid, tablets and ODT	0.15-0.2 mg/kg/dose PO	q8h prn	8 mg/dose
Metoclopramide liquid, tablets	0.1-0.3 mg/kg/dose PO	q6h prn	10 mg/dose
Prochlorperazine tablets and suppositories	0.1 mg/kg/dose PO/PR	q6-8h prn	10 mg/dose



CHEO



When do you start preventive treatment?



Consider and discuss preventive treatment:

- Frequent headaches (≥ 4 headache days/month) and moderate migraine-related disability or BOTH **(Level B)**
- Medication overuse **(Level B)**

Goal for prevention therapy

$\geq 50\%$ in frequency
AND/OR
 ≤ 4 headache days/month

2019 AAN/AHS Pediatric Migraine Treatment ¹

Level B recommendation

Propranolol (20-40 mg TID)
Topiramate (2-3mkg up to 100mg/d)
Amitriptyline (0.25-1mkg)+ CBT

1. Oskoui M, et al. AAN/AHS Guideline, Neurology (2019)
2. Szperka C. Headache. Continuum (2021)



Preventive Migraine Therapies you Can Consider

Over-the-counter preventive treatment

TREATMENT	DOSAGE	INTERVAL	MAXIMUM
Magnesium (elemental)	9 mg/kg/day	BID or qHS	600 mg/day
Coenzyme Q10 or ubiquinol	1-3 mg/kg/day	Daily to BID	200 mg/day
Vitamin B2 (riboflavin)	200-400 mg/day	Daily to BID	400 mg/day

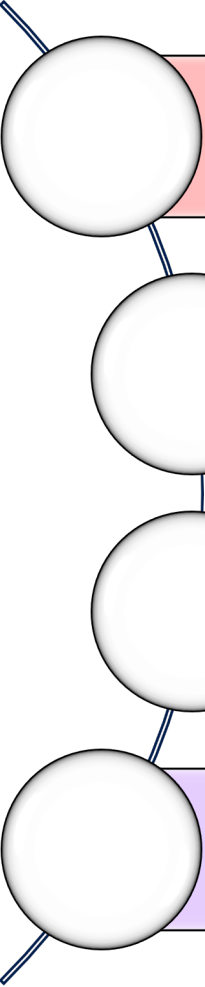
Pharmacological preventive treatment

TREATMENT	DOSAGE	INTERVAL	MAXIMUM
Topiramate	2 mg/kg/day	BID	200 mg/day
Propranolol	2-4 mg/kg/day	TID	120 mg/day
Amitriptyline	1 mg/kg/day	HS	75 mg/day

SUGGESTIONS FOR PREVENTIVE TREATMENT

1. Therapeutic trials should be a minimum of 6-8 weeks at the target dose.
2. Titration of pharmacologic preventive interventions to the target dose should start low and go slow, over 4-8 weeks.
3. Screen for contraindications to treatments prior to starting them.
4. Treatment decisions need to be individualized based on the patient's preferences and medical profile.

Key points



Headaches are common in youth.

First step is to rule out secondary causes.

Systematic approach to diagnosing pediatric primary headache disorders is crucial.

Multi-modal therapy is most effective.



THANK YOU

