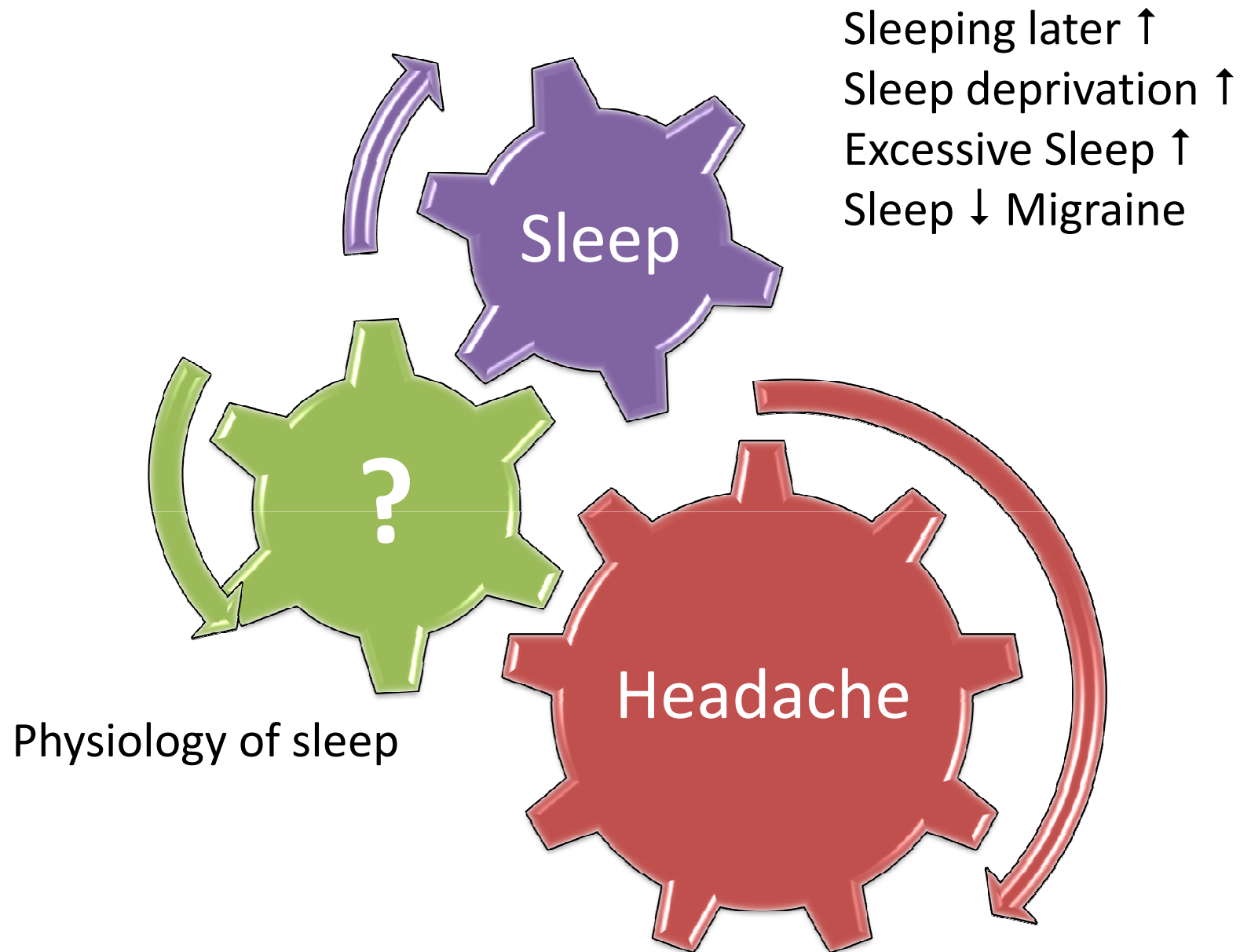


Headache and Sleep Disorders

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Clinical, Anatomical, and Physiologic Relationship Between Sleep and Headache
Headache 2003;43:282-292

Table 2.—Relationship Between Headache and Sleep*

Headache is a symptom of a primary sleep disturbance

Sleep disturbance is a symptom of a primary headache disorder

Sleep disturbance and headache are symptoms of an unrelated medical disorder

Sleep disturbance and headache are both manifestations of a similar underlying pathogenesis

*Data from Paiva et al.³

Paiva T, et al. The relationship between headaches and sleep disturbances. *Headache*. 1995;35:590-596.

Potential relation Classification

Table 1 Sleep and headache: classification in accordance to potential relation between sleep and headache. Modified after Paiva and Hering-Hanit [2]

Type of relation	Definition	Examples
Sleep-triggered or sleep-related headaches	When 75% of the episodes occur during sleep or upon awakening	Migraine, cluster headache, chronic paroxysmal headache
Sleep duration induced headache	Headache induced by shortened or prolonged sleep	Sleep deprivation induced headache (tension-type?), migraine
Sleep phase-related headaches	Headache related to sleep macrostructure	Migraine? Cluster headache?
Sleep-relieved headaches	Headache relieved by sleep	Migraine, confusional headache
Dreams and headache	Headache related to dreaming	Migraine?
Effects of headaches on sleep	Sleep disruption induced by headache	Hypnic headaches Cluster headache

**Table 1.—Extent of Relationship Between
Sleep and Headache***

Sleep-related headaches (during or after sleep)
Sleep-phase-related headaches
III, IV, rapid eye movement: migraine
Rapid eye movement: cluster headache, chronic paroxysmal hemicrania
Length of sleep and headaches
Excessive deep sleep
Lack of sleep
Sleep disruption
Sleep relieves headaches
Migraine and other types of headaches
Sleep disorders and headaches
Sleep apnea and headaches
Somnambulism and headaches
Other parasomnias and headaches
Effect of headaches on sleep
Minimal to major sleep disruption
Dreams and headaches

*Data from Sahota and Dexter.⁴ Reprinted with permission of the American Headache Society.

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Most frequent differential Diagnosis to sleep related headaches

Primary headaches

- Migraine
- Cluster headache
- Tension-type headache
- Hypnic headaches

Secondary headaches due to

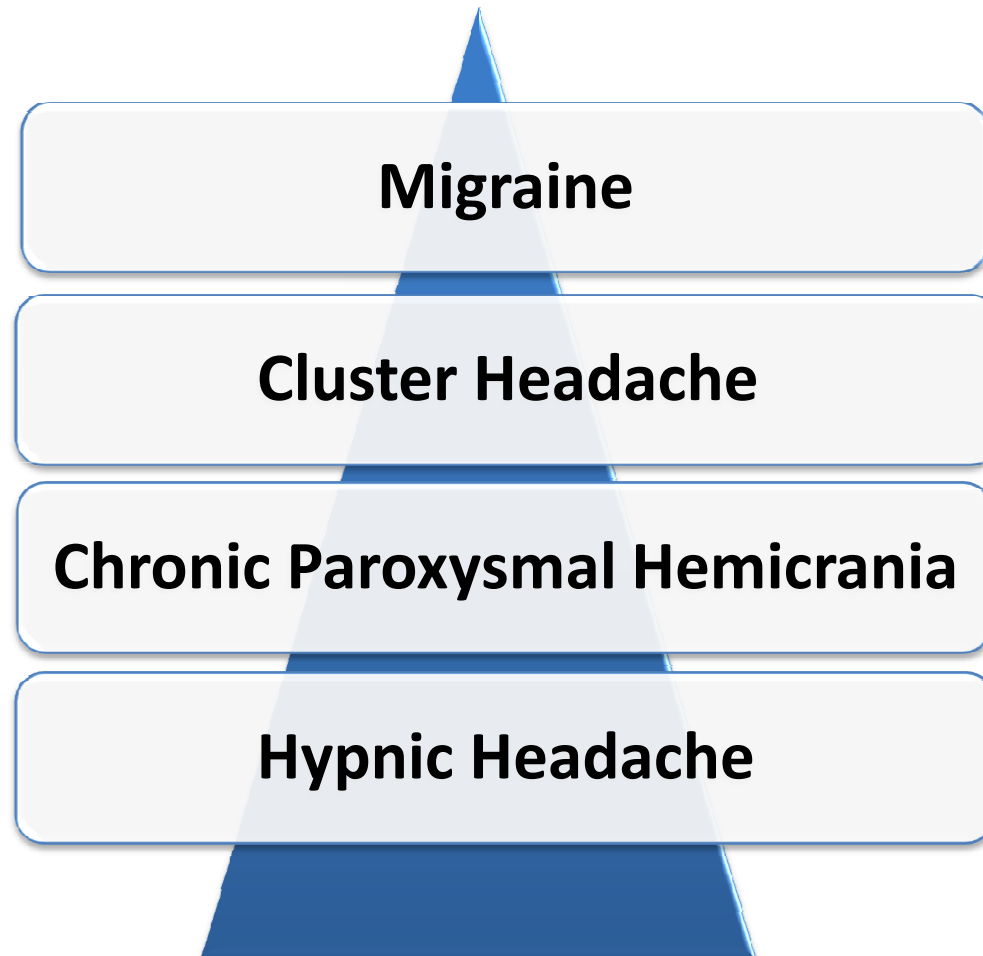
- Cerebral tumours
- OSAS and other Sleep Disordered Breathing
- Restless legs Syndrome and Periodic Legs

Movements

- Insomnia, sleep fragmentation, prolonged and shortened sleep

- Drugs
- Alcohol
- Depression
- Mental stress or posttraumatic stress syndromes
- Neuromuscular disorders
- Cancer
- Epilepsy
- Cardiovascular diseases
- Chronic obstructive lung diseases

Primary Headache Disorder related to Sleep



Anatomy And Physiology Of Sleep

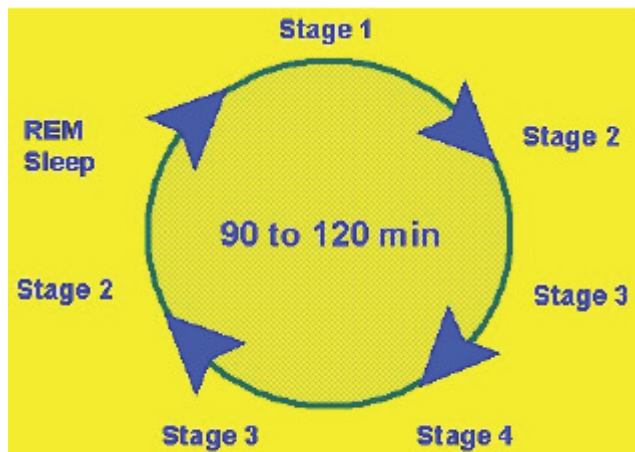
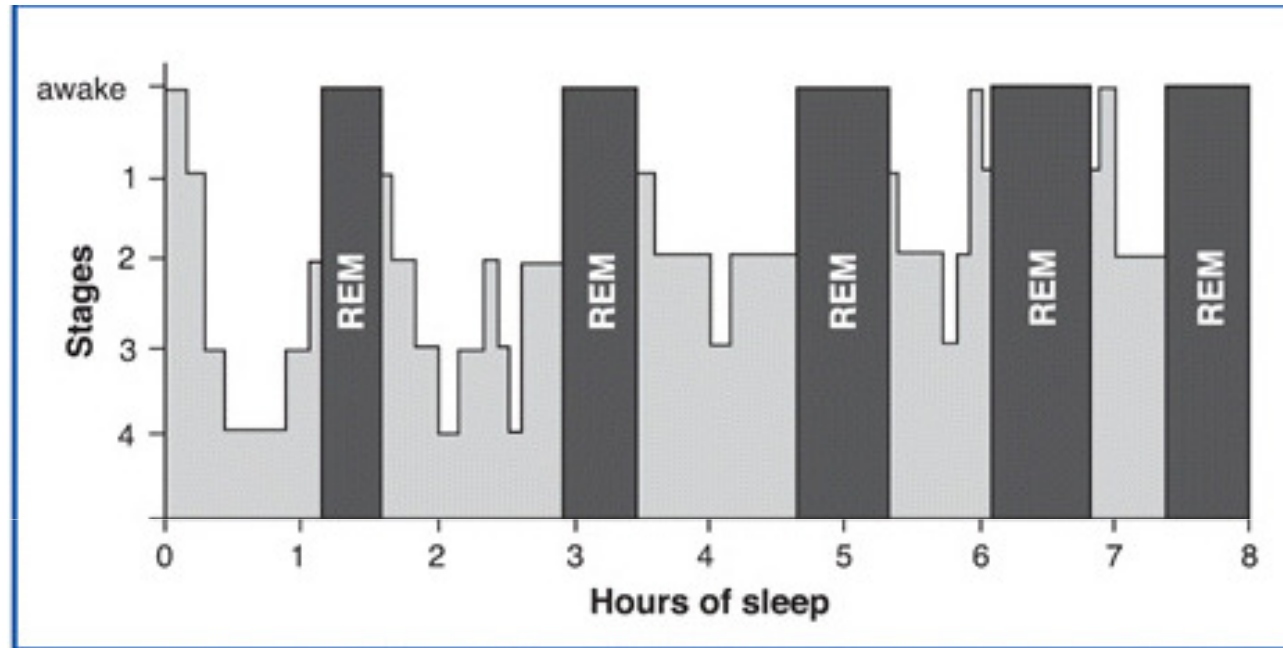


Diagram of the different stages of the sleep cycle.

Sleep Cycle Stages

- Stage 1
 - drowsiness
- Stage 2
 - period of light sleep
- Stages 3 and 4
 - deep sleep known as slow-wave or delta sleep
- Stage 5
 - rapid eye movement or REM characterised by intense dreams

The Hypothetical Anatomical Basis

REM sleep “on” cells	lateral nucleus reticularis pontis oralis (ventral to the locus ceruleus in the pontine tegmentum)
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REM sleep “off” cells	noradrenergic locus ceruleus serotonergic dorsal raphe nucleus
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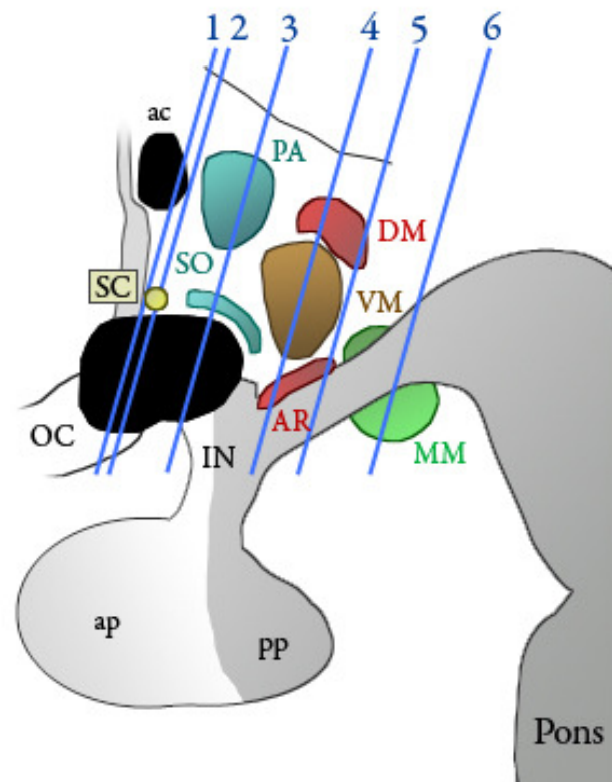
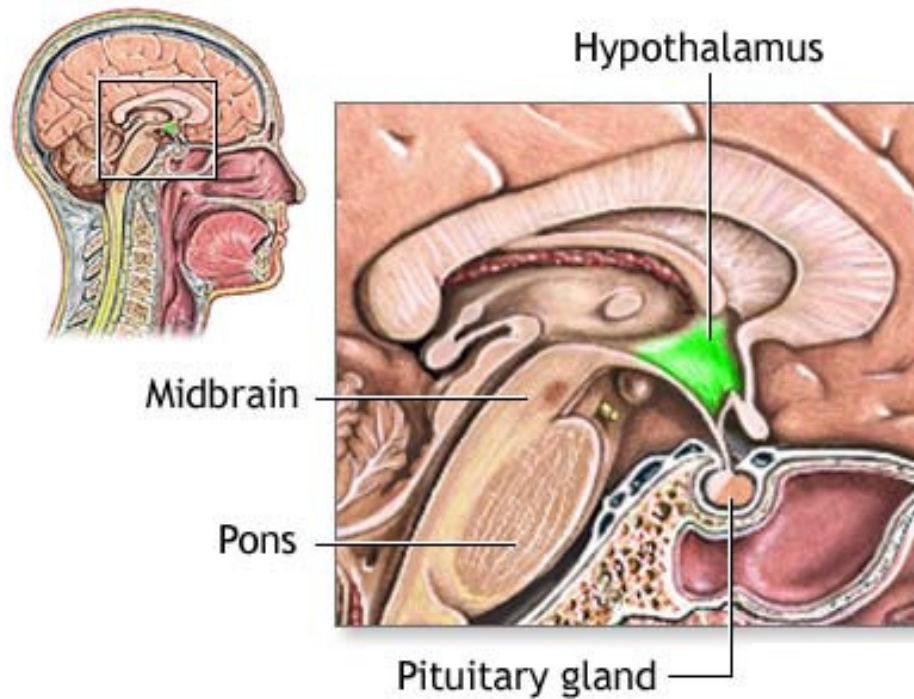
NREM sleep	the medullary nucleus of the solitary tract nucleus reticularis of the thalamus anterior hypothalamus basal forebrain
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Neurotransmitters and Sleep

- **Acetylcholine** →
activation in wakefulness and in REM sleep
- **Norepinephrine** → inhibit REM sleep
- **Dopamine, histamine, GABA , adenosine, opioid, other neuropeptides** → unclear role

Circadian Physiology of Sleep

- Principal biological clock is located in the **suprachiasmatic nuclei (SCN)** of the hypothalamus.
- Human biological pacemaker has an intrinsic periodicity of 24.9 hours
- Photic entrainment is mediated by two pathways:
 1. direct retinal projection to the SCN
 2. indirect pathway from the lateral geniculate nucleus
- Endogenous **melatonin** is probably the strongest biological marker of the circadian rhythm in humans.



ac	- anterior commissure
ap	- anterior pituitary
AR	- arcuate nucleus
DM	- dorsomedial nucleus
IN	- infundibulum
MM	- mammillary nuclei
oc	- optic chiasm
PA	- paraventricular nucleus
pp	- posterior pituitary
SC	- suprachiasmatic nucleus
SO	- supraoptic nucleus
VM	- ventromedial nucleus

Clinical Association of Sleep and Headache

Migraine

- Occurring during nocturnal sleep, after brief periods of diurnal sleep, and awakening
- A peak occurrence in the early morning
- Periods of REM sleep and with morning arousals (stage III, stage IV)
- Autonomic activity and serotonin change in both REM sleep and during a migraine attack.

Migraine

- 30% to 55% Somnambulism
- Outside attack → normal sleep , slight ↑ REM quantity and latency
- 60% elation, irritability, depression, hunger, thirst, or drowsiness preceding 24 hours
suggestive of hypothalamic origin
- A disturbance of the cerebral circuits concerned with adaptive homeostatic mechanisms

Cluster Headache

- Occur about 90 minutes after the person falls asleep
- Coincides with the onset of the first REM sleep(during stages II and IV)
- Serotonergic transmission in the central nervous system, alters circadian rhythm

Hypnic Headache

- Frequent occurring every night or more than 4 nights per week
- The principal biological clock is located in the SCN of the hypothalamus
- Subsequent reduction in melatonin

Treatment of sleep disorders

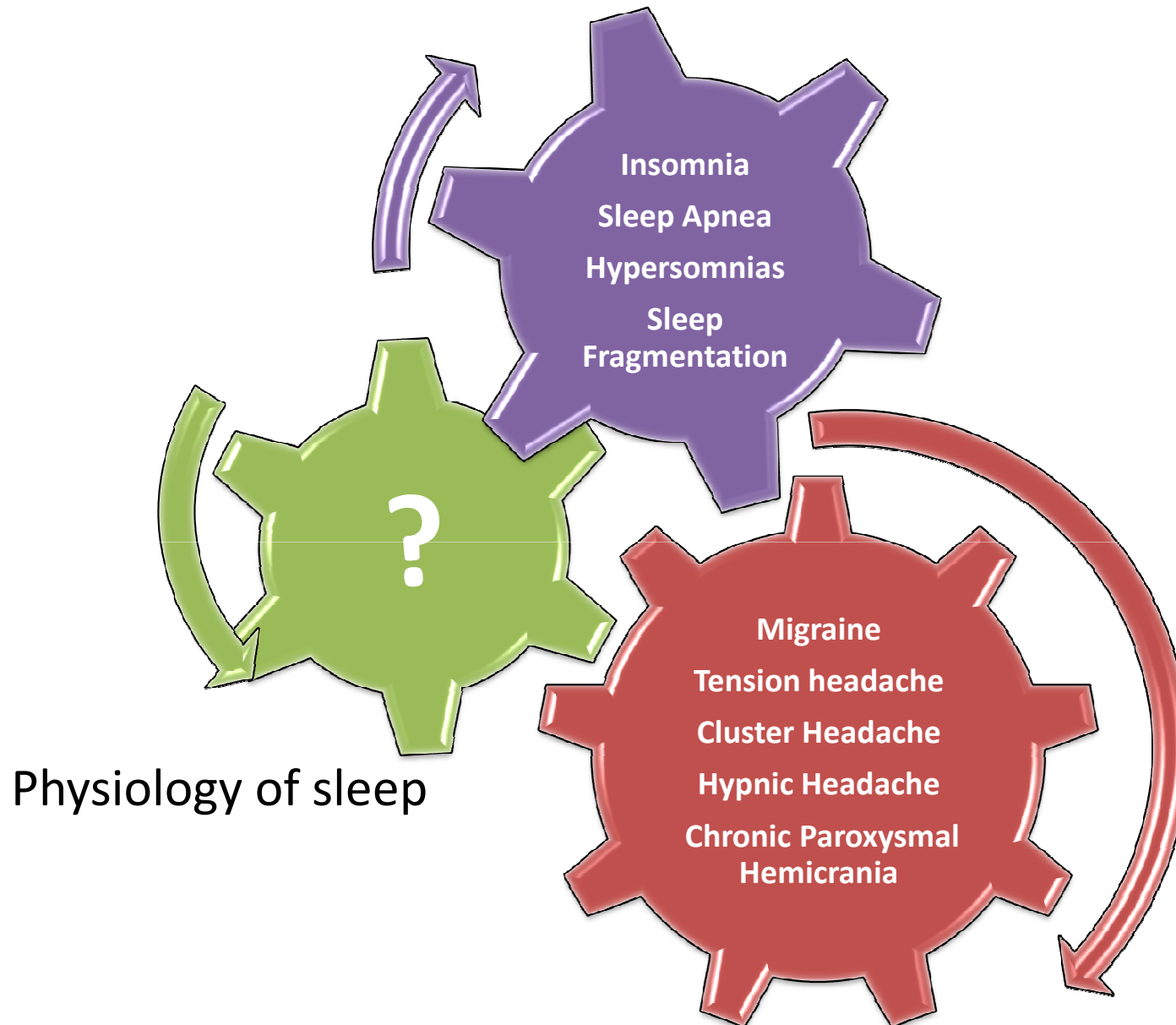
- Sleep disorders most implicated with headache
 - obstructive sleep apnea
 - primary insomnia
 - circadian phase abnormalities.
- Treatment of obstructive sleep apnea can improve headache
 - polysomnography
 - method: weight loss, treatment of nasal allergies, upper airway surgery, and CPAP

Sleep regulation

- Behavioral sleep therapy includes:
 - (1) Schedule consistent bedtime that allows 8 hours time in bed;
 - (2) Eliminate TV, reading, music in bed
 - (3) Use visualization technique to shorten time to sleep onset
 - (4) Move supper >4 hours before bedtime
 - (5) Discontinue naps

Summary

- Medical conditions (e.g. obstructive sleep apnea, depression) that may disrupt sleep and lead to nocturnal or morning headache
- Primary headache disorders which often occur during nocturnal sleep, can readily be diagnosed through clinical evaluation
- Patients with poorly defined nocturnal or awakening headaches should undergo polysomnography to exclude a treatable sleep disturbance



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