

Sleep & Sleep Disorders in Older adults

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Objectives

1. Understand normal changes in sleep that occur as people age
2. Discuss a few of the sleep disorders that affect older adults
3. Review some of the non-pharmacological management strategies for sleep problems

Normal Sleep

- A universal behaviour in all animal species
- Occupies $\sim 1/3$ of the human life
- Necessary for survival
 - Prolonged sleep deprivation can eventually lead to death

Physiology of Sleep

- Sleep is comprised of 2 states:
 - REM (rapid eye movement) sleep
 - NREM (non-rapid eye movement) sleep
- NREM:
 - 75% of total sleep time
 - Stages 1-4
 - Physiological state of hypoarousal
 - Slow HR (5-10 beats slower), low BP, reduced muscle tone, low RR
 - Increases after exercise and starvation

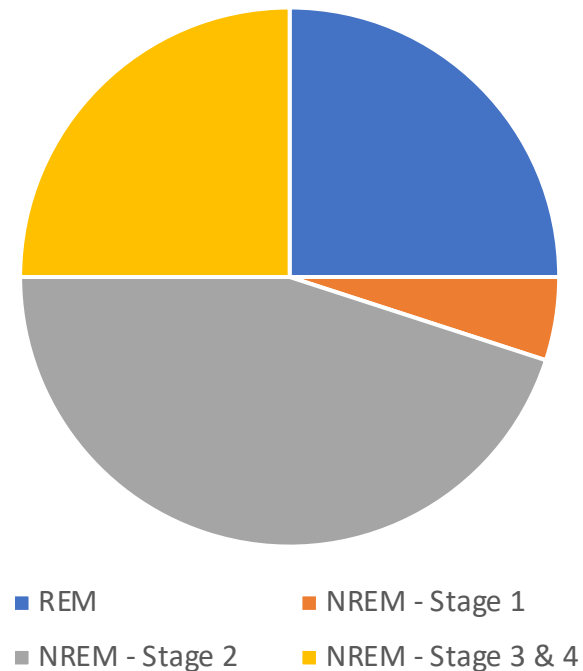
Physiology of Sleep

- NREM

- **Stages:**

- Stage 1 (5%): Theta waves
 - Stage 2 (45%): K-complexes and Sleep spindles
 - Stage 3 and 4 (25%): Delta waves “deep sleep”
 - Arousal from stage 3 or 4 sleep can result in unusual characteristics such as disorientation. Brief arousals are associated with amnesia for events that occur during the arousal

Stages of Sleep

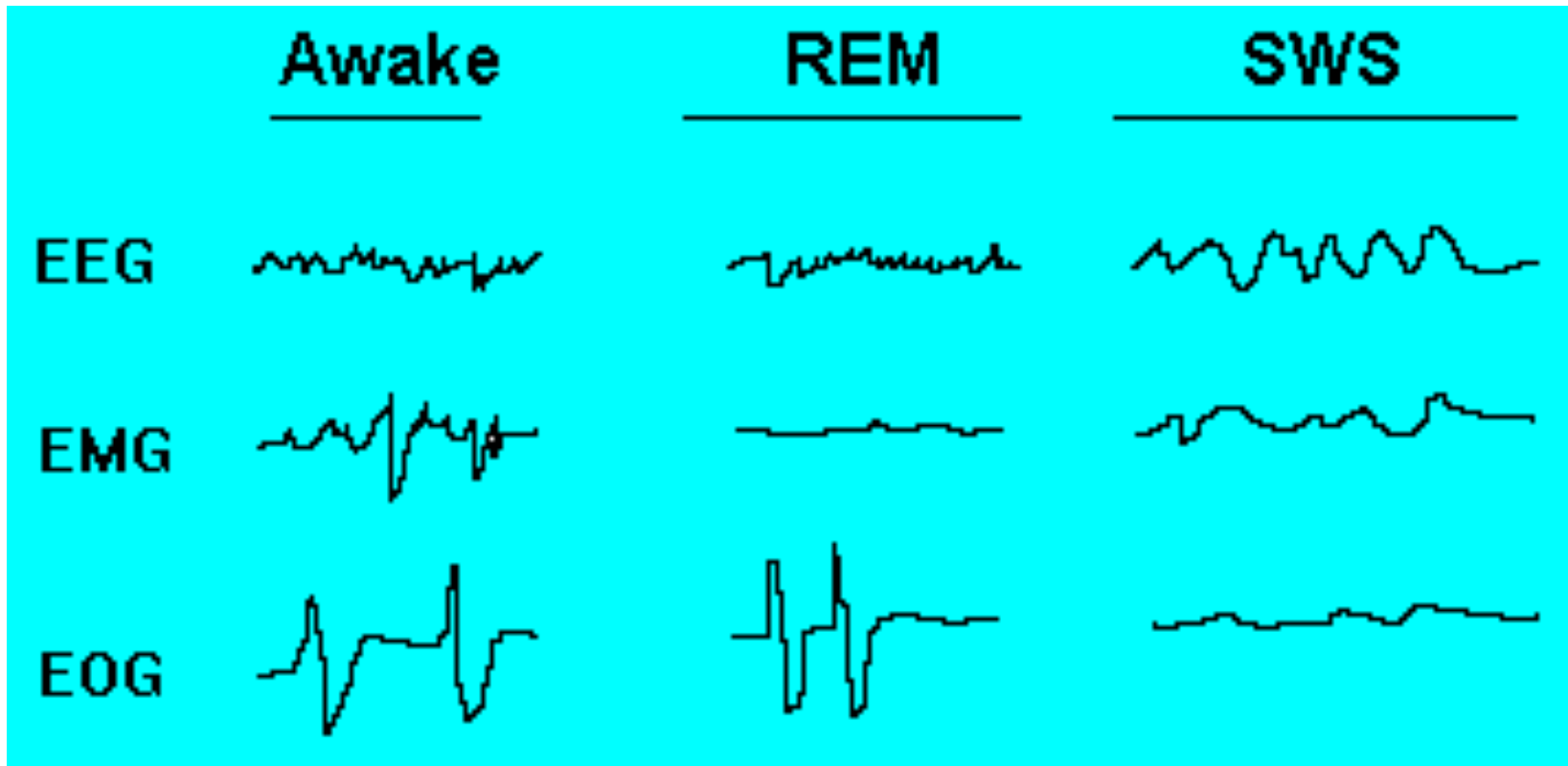


Physiology of Sleep

- REM

- 25% of total sleep time
- Called “Paradoxical Sleep”
 - EEG looks the same as awake state
 - HR, RR, BP are all higher than during wakefulness and with much variability minute to minute
 - Brain oxygen use increases
 - Poikilothermic condition
 - Penile erection (important for determining cause of impotence)
 - Almost total paralysis of skeletal muscles
 - Dreams – abstract and surreal
- Increases after strong psychological stimuli, such as difficult learning situations and stress

Stages of Sleep



EEG (electroencephalogram)

EMG (electromyogram)

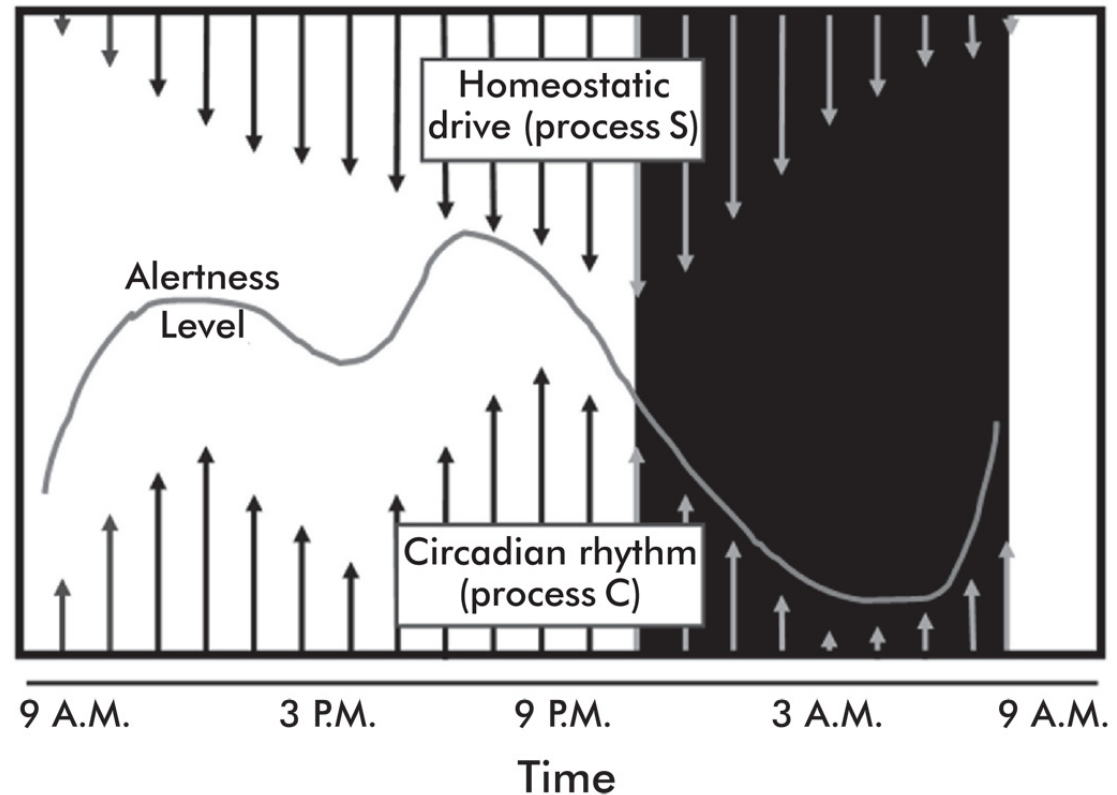
EOG (electroculogram)

Physiology of Sleep

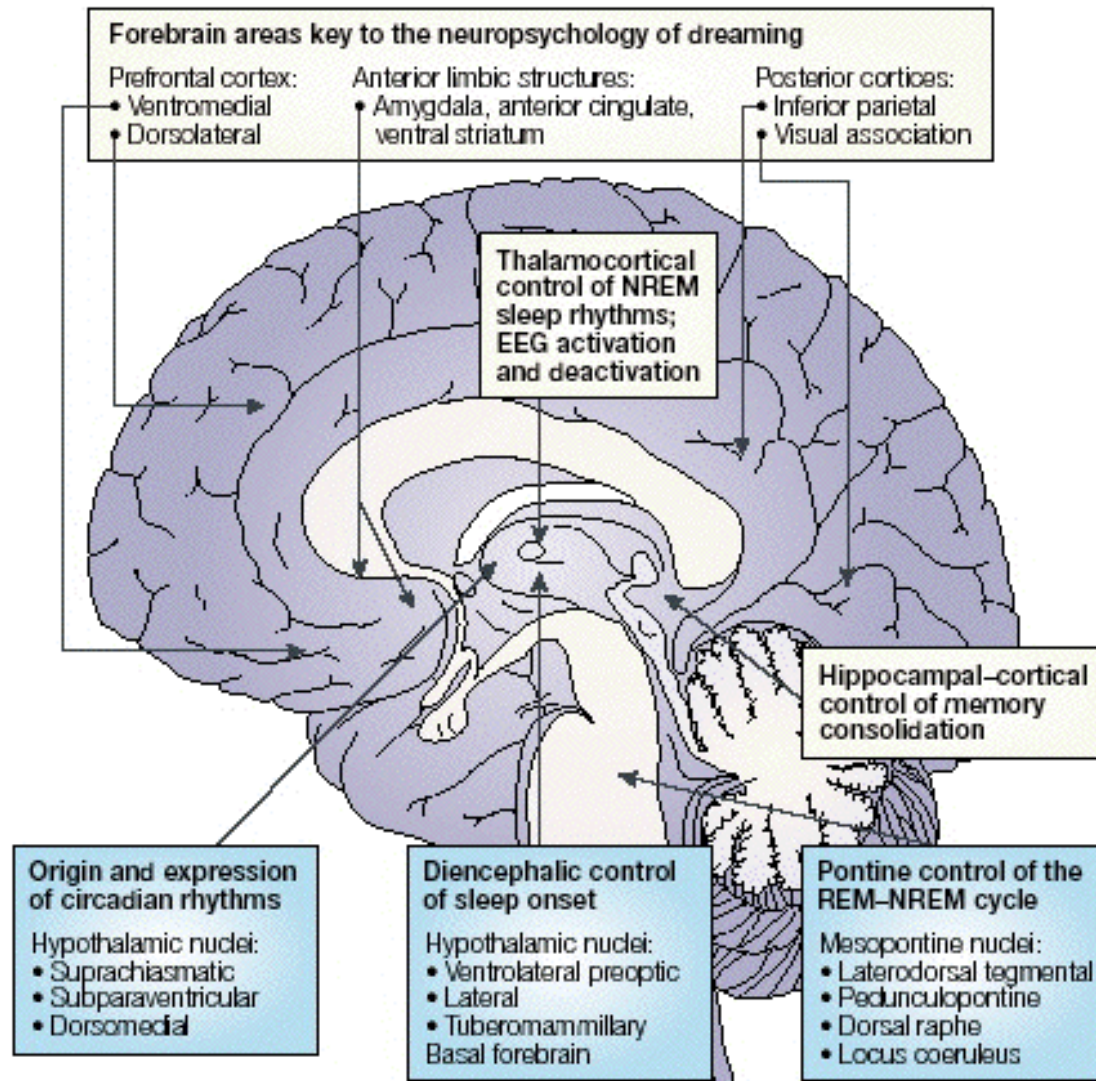
- Sleep is cyclical
 - REM occurs every 90-100 minutes
 - First REM period is shortest, lasting less than 10 minutes
 - Later REM periods can last 15-40 minutes
 - Most REM sleep occurs in the last 1/3 of the night
 - Most stage 4 sleep occurs in the first 1/3 of the night

Physiologically, human sleep is regulated by two processes, a homeostatic factor and a circadian factor

Alertness level is determined by the interaction between two processes. The sleep homeostatic drive (Process S) promotes sleep and builds up during wake, reaching a maximum in the late evening (near the usual sleep time). The circadian rhythm system (Process C) promotes wakefulness during the day. It is biphasic and tends to dip in the midafternoon. Process C also reaches its peak in the evening to counterbalance the accumulation of homeostatic drive that has built up throughout the day and it begins to fall just before the usual bedtime. This system promotes wakefulness during the day and consolidates sleep at night.



Neuro-Anatomy of Sleep



Neurotransmitters in Sleep-Wake Regulation

- Wake
 - Acetylcholine
 - Dopamine
 - Glutamate
 - Histamine
 - Orexin
 - Norepinephrine
 - Serotonin
- NREM sleep
 - GABA
 - Adenosine
- REM sleep
 - Acetylcholine
 - Dopamine
 - Glycine (atonia)

Sleep Architecture

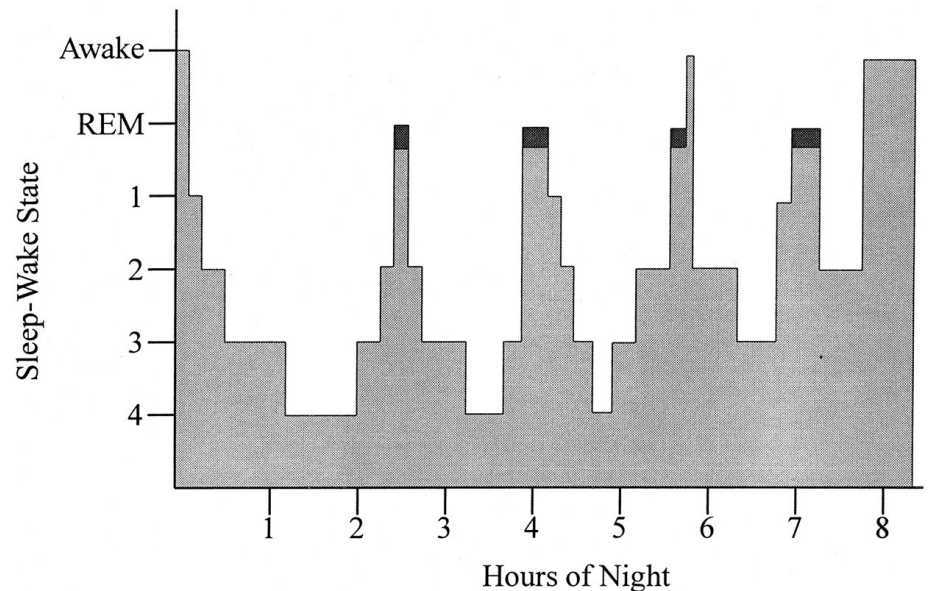
Progression of sleep across the night is called sleep architecture and is displayed on a sleep histogram

NREM sleep

Stage 3 and 4 generally observed during the first half of the sleep period

REM sleep

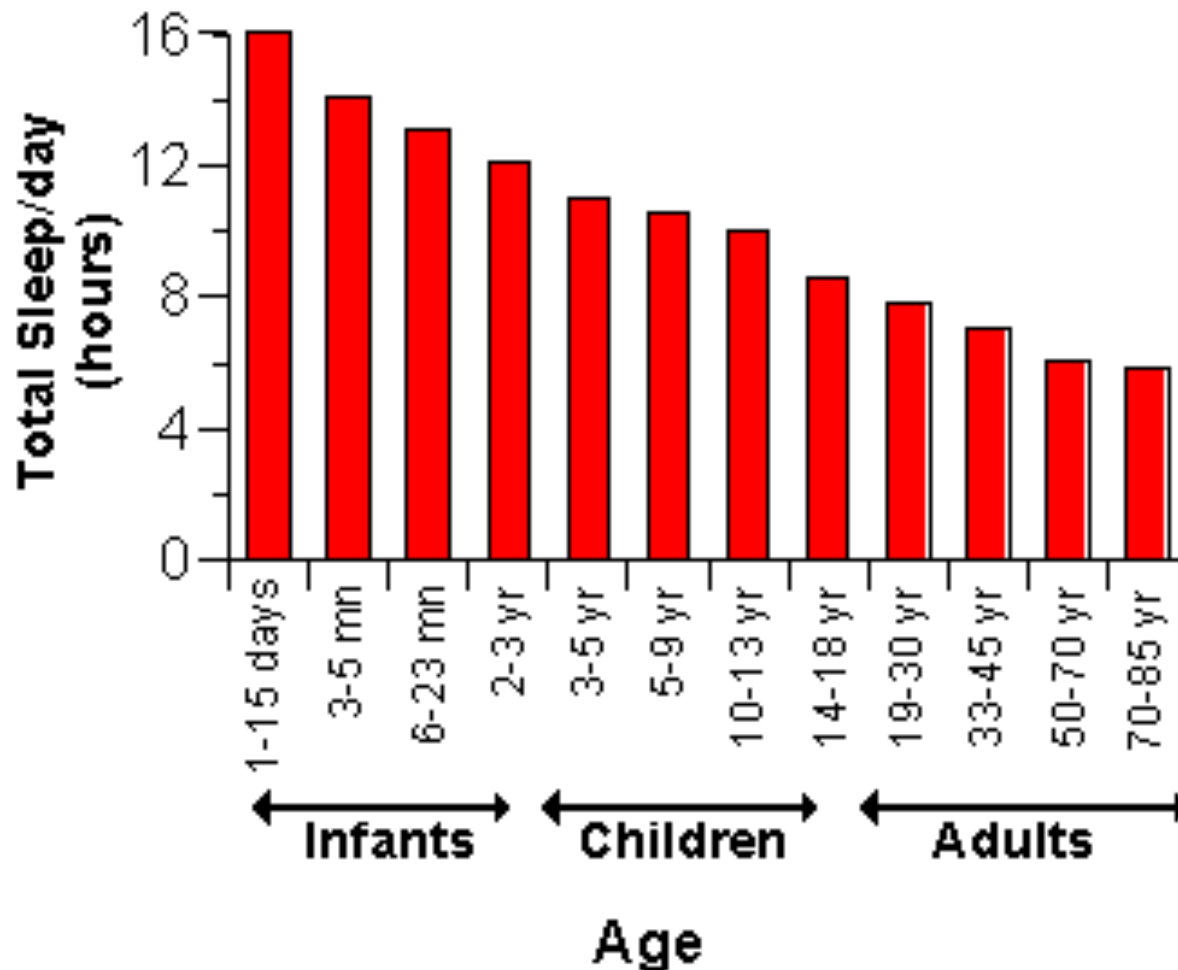
Occurs most frequently during the last 1/3 of the sleep period



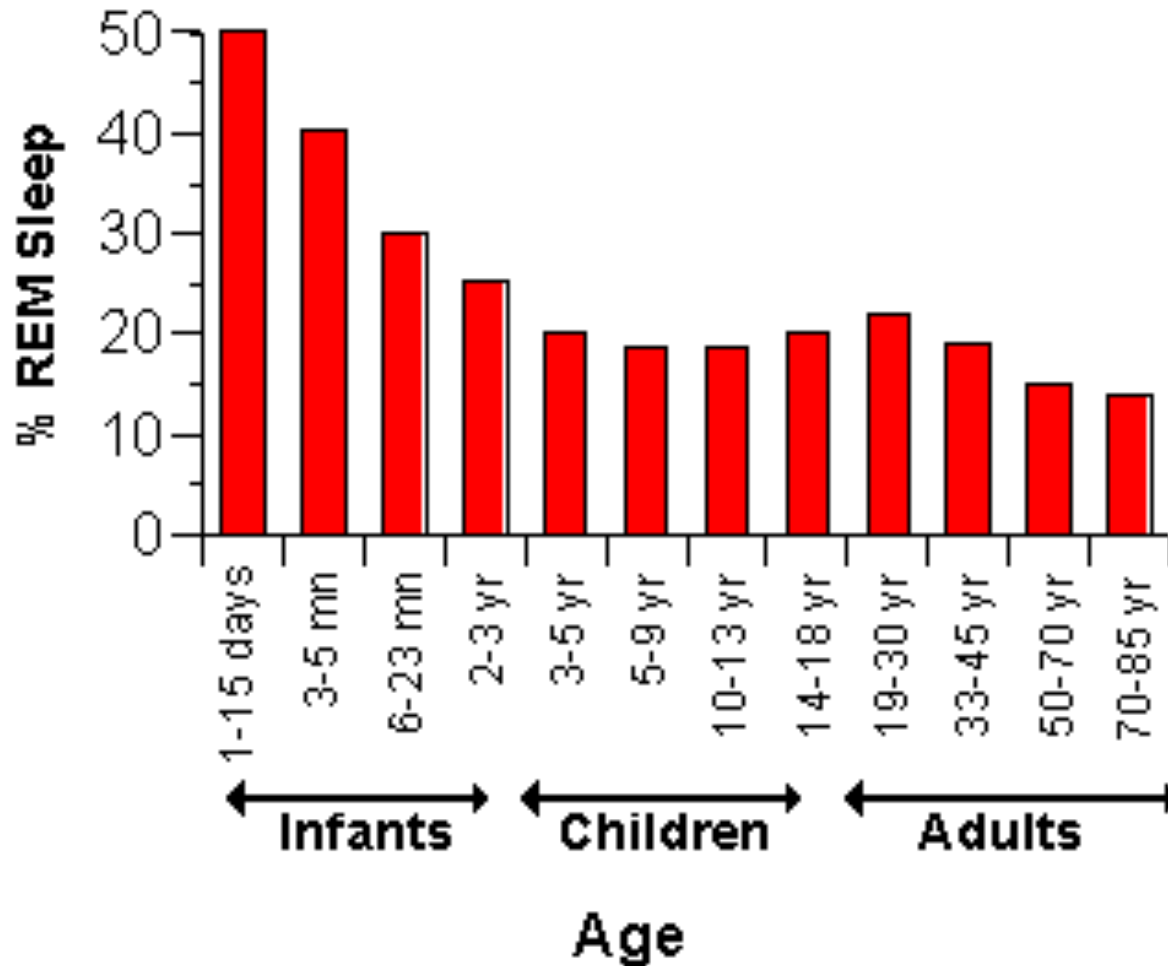
Normal Changes with Aging

- Decreased slow wave sleep (Stage 3 and 4)
- Increase in Stage 1 and 2 sleep
- Reduced total sleep time
- Decreased continuity of sleep
 - Increased number of arousals
 - Increased duration of arousals
- Decreased sleep efficiency
- Advance in circadian phase
 - Wake up at an earlier clock hour
- Phase advancement (REM earlier in the night)
- Decline in REM sleep

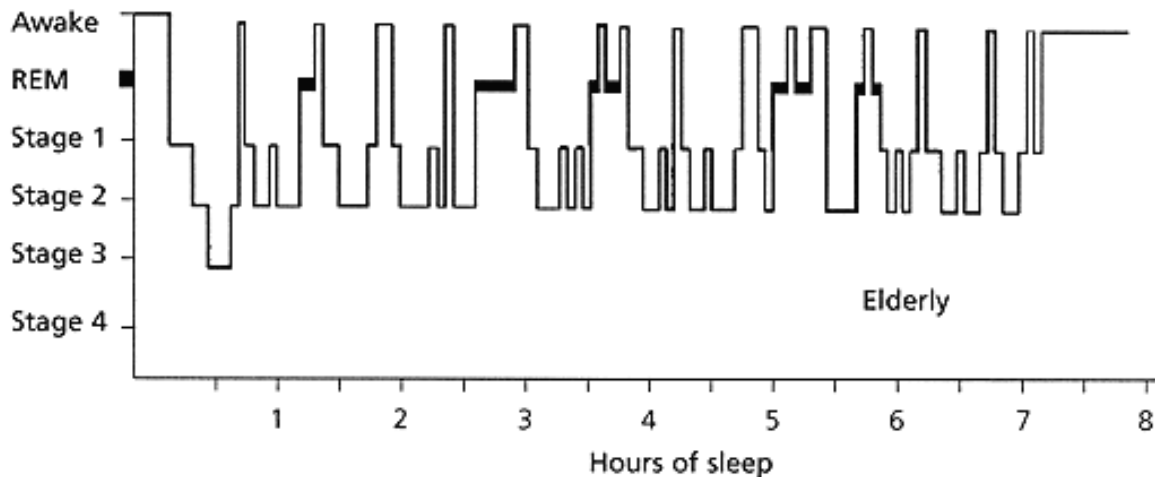
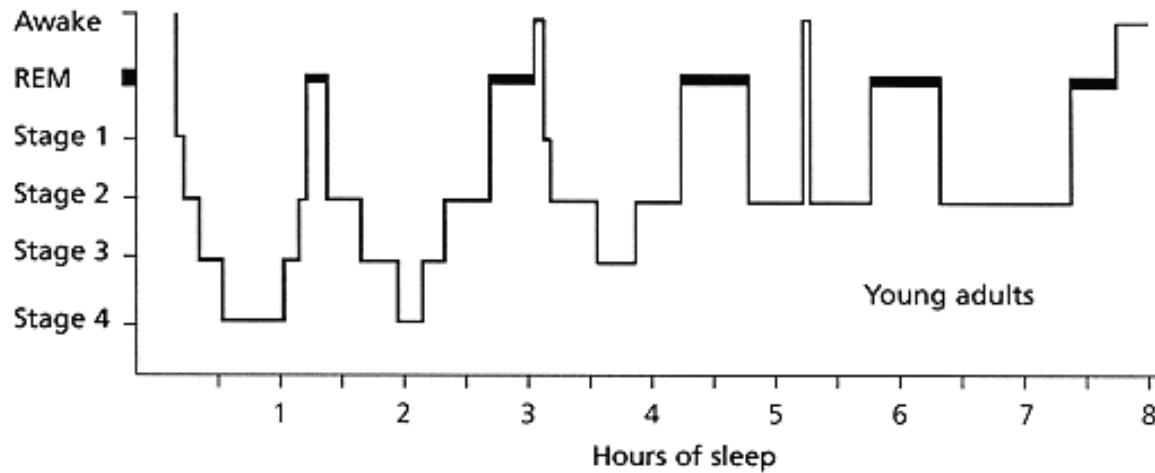
Changes of Total Sleep With Age



Changes of REM Sleep With Age



Sleep in the Old Vs. Young



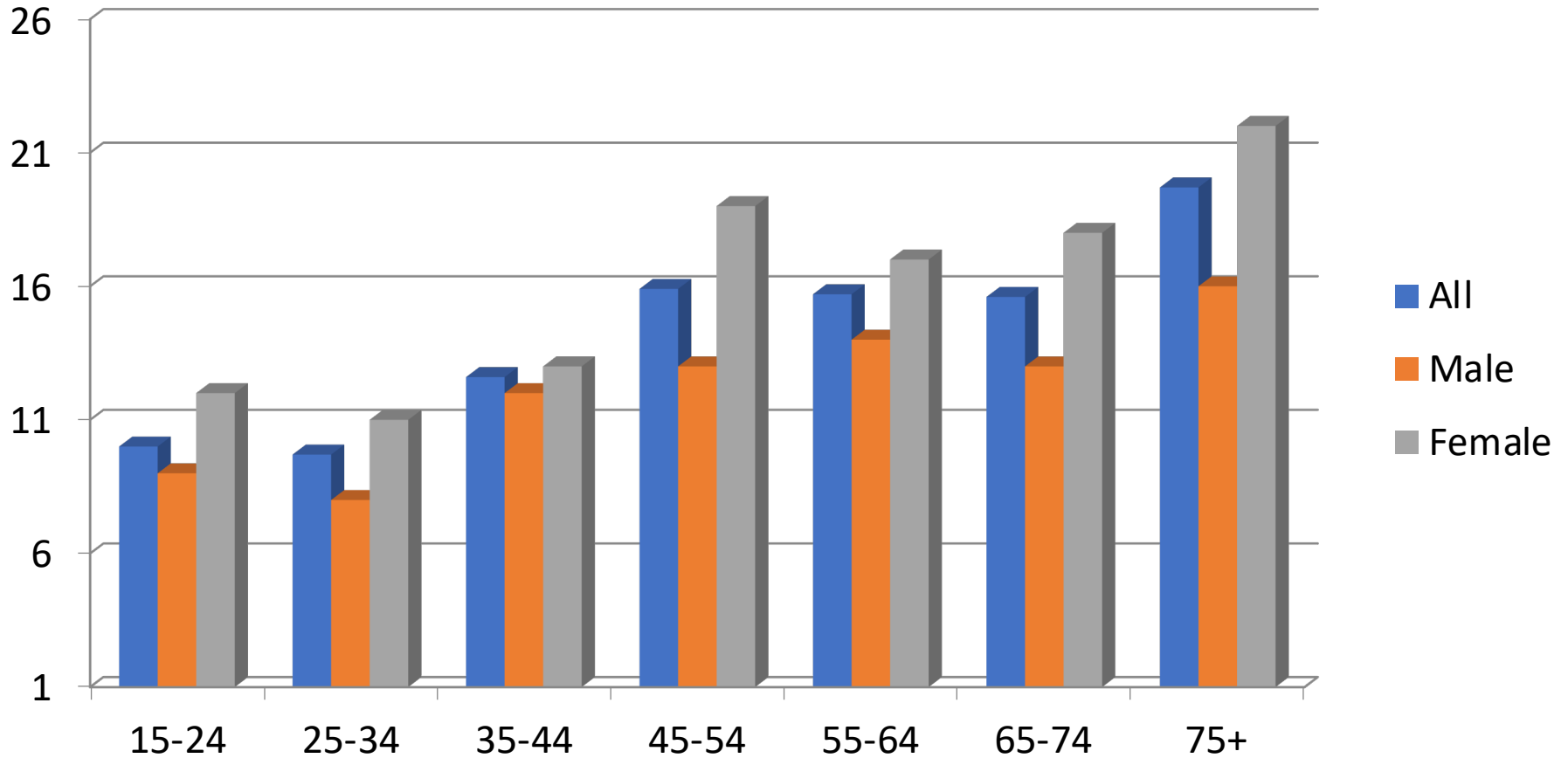
Sleep Disorders

Insomnia

Insomnia

- More than 50% of elderly people have insomnia
- In 2002 Canadian Community Health Survey, an estimated 3.3 million Canadians (13.4% of the household population aged 15 or older) had insomnia
- Older women are more likely to experience insomnia than older men

Prevalence (%) with Insomnia (Age)



Thorpe, L. (2010) Sleep and Circadian Rhythm Disorders in the Elderly. [Powerpoint slides] Original Source: Tjepkema M. Insomnia. Health Rep. 2005 Nov;17(1):9-25.

Insomnia Disorder: DSM 5

- Dissatisfaction with sleep quality or quantity associated with one or more of the following:
 - Difficulty initiating or maintaining sleep
 - Early-morning awakening with inability to return to sleep
- Impairment in daytime functions
- At least 3 nights per week
- Sleep difficulty present for at least 3 months
- Sleep difficulty occurs despite adequate opportunity for sleep

Impairment in Daytime Functions

- Fatigue
- Attention, concentration or memory impairment
- Social, occupational, academic
- Mood disturbance or irritability
- Daytime sleepiness
- Motivation
- Proneness for errors or accidents
- Tension headaches and /or GI symptoms
- Concerns or worries about sleep

Factors Contributing to Sleep Problems in the Elderly: Medical Conditions

- Pain from any source
 - Arthritis and neuropathies
 - Attempt to treat condition causing the pain
- COPD
- Cerebrovascular disease
- Cardiovascular disease (angina)
- Gastrointestinal disease (GERD, Peptic ulcer disease)
- Neurologic Disease (Parkinson's disease, Alzheimer's disease)
- Nocturia/Dependent Edema

Factors Contributing to Sleep Problems in the Elderly: Psychosocial

- Decreased activity
- Loss of routine
- Loss of a spouse
- Boredom
- Loneliness
- Dysfunctional beliefs about sleep
- Poor self-perceived health
 - Improved self-perceived health is associated with remission of chronic insomnia

Factors Contributing to Sleep Problems in the Elderly: Medications

- Alcohol
- Anticholinergics
- Antidepressants
- Antihypertensives agents
- Caffeine
- Corticosteroids
- Diuretics
- Herbal remedies
- Histamine H₂ blockers
- Levodopa
- Nicotine
- Sympathomimetics

Sleep Apnea

Sleep Apnea

- Predominant type in the elderly is obstructive
- Sleep apnea prevalence increases with age
 - Males > females
 - Prevalence in community dwelling elderly 65-95 years old, prevalence rates were 62%
 - Sleep Heart Study prevalence 32-36%

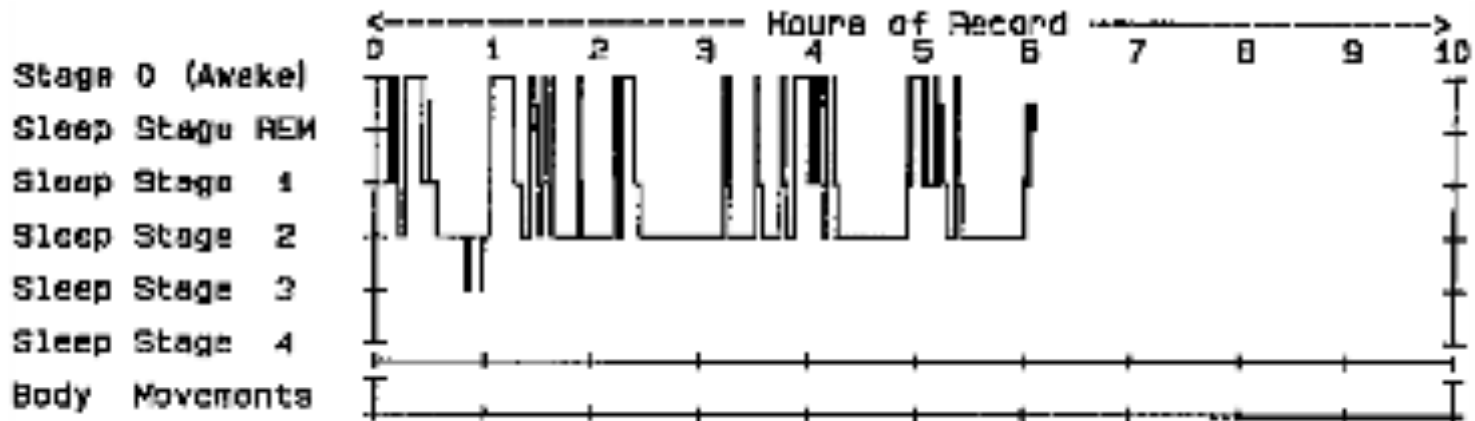
Sleep Apnea

- Risk Factors:
 - Obesity
 - Large neck
 - Upper airway structural abnormalities
 - Nasal congestion
 - Endocrine abnormalities
 - Sedating drugs

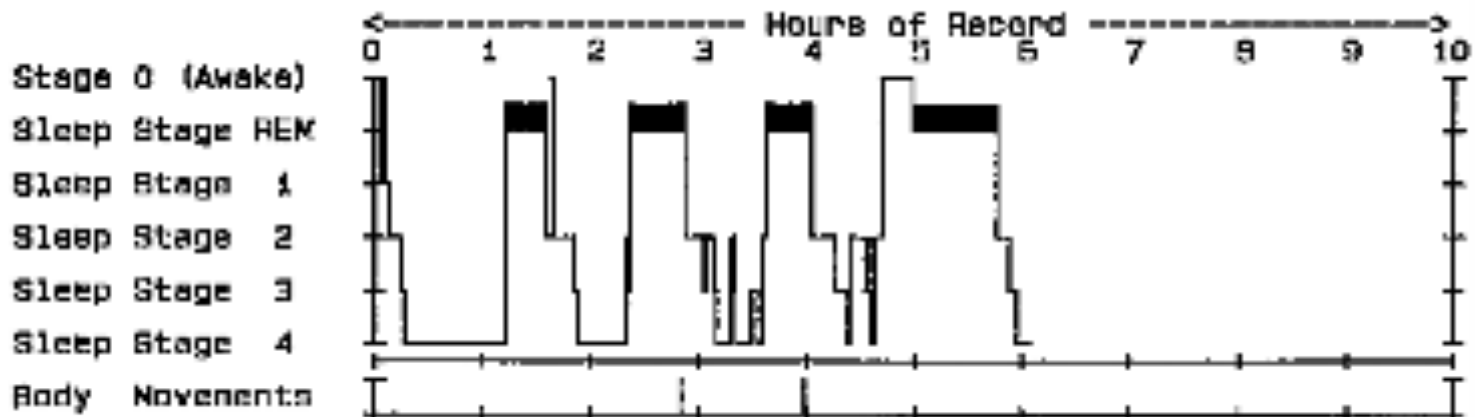
Management of Sleep Apnea

- CPAP
 - Air pressure acts as a pneumatic splint to maintain upper airway patency during sleep
- BiPAP
 - Expiratory pressure less than inspiratory pressure making expiration more natural
- Use of sedatives at night can worsen condition

Sleep Histogram before and after CPAP treatment



A



B

Other Sleep Disorders

Periodic Limb Movement Disorder (PLMD)

- Prevalence increases with age
 - Clinically significant PLMD is seen in 30-45% of adults >60 vs. 5-6% of general adults
- Repetitive stereotyped leg movements that disturb sleep
 - Excessive daytime sleepiness
- At least 5 kicks/hour of sleep
- Complain of leg kicks, cold feet, excessive daytime sleepiness and insomnia
- Usually found incidentally on PSG
- SSRIs, SNRIs, TCAs may “unmask” PLMD
- Treatment:
 - Dopaminergic Medications

Restless Legs Syndrome

- Urge to move accompanied by uncomfortable sensations, predominantly in the legs that are relieved by movement, occur when sedentary, and are worse in the evenings
- Increases with age
 - RLS occurs in 28% of adults > 65
- Associated with PLMD
 - PLMD diagnosed with PSG whereas RLS is clinical diagnosis
- Familial in 50% of cases
- Abnormalities of dopamine and iron metabolism
- Iron deficiency can worsen
- Associated with kidney failure
- Management
 - Check iron levels, review medications
 - Dopaminergic agents (1st), Gabapentin & opioids (2nd), Benzos (3rd)

REM Behavior Disorder (RBD)

- Prevalence in adults 0.4-0.5%
- Incomplete REM atonia associated with motoric activation during dreams
- Patient or bed partner complains of violent, often injurious, activity during sleep
- Themes are usually of violence and running
- Sometimes the patient is able to incorporate ongoing conversation and activity into the dream, appears as if hallucinating
- Older men > 60
- Associated with Parkinson's, LBD
- 5-year risk of developing a neurodegenerative condition after onset of RBD 18-45%
- Can be induced by SSRIs, SNRIs, and TCAs
- Management:
 - Clonazepam (1st line)

Associations and Consequences of Sleep Disorders in the Elderly

- Depression
- Falls
- Excessive Daytime sleepiness
- Memory and Cognition
- Cardiopulmonary disease
- Increased use of medications
 - Falls, cognitive impairment, sleep disturbances

Non-Pharmacological Treatment

Non-Pharmacological Management of Insomnia

- CBT-i
 - Goals:
 - Alter dysfunctional beliefs and attitudes presumed to maintain insomnia
 - Change maladaptive sleep habits
 - Reduce autonomic arousal

CBTi: Cognitive Therapy

- Identifies and shifts negative thoughts and assumptions about sleep
 - Dysfunctional belief about sleep
 - “Everyone should try to get 8 hours a night”
 - “Older adults can do little to improve their sleep” may perpetuate sleep difficulties over time

CBTi: Cognitive Therapy

- Patient learns 6 basic cognitive strategies:
 1. Maintain realistic expectations
 2. Don't blame insomnia for all impairments
 3. Never *try* to fall asleep
 4. Don't give too much importance to sleep
 5. Don't catastrophize over a poor night's sleep
 6. Develop tolerance to the effects of insomnia

Sleep Hygiene

- Identifies and eliminates maladaptive behaviours
 - Do not spend too much time in bed
 - 7-8 hours per night
 - Maintain consistent sleep and wake times
 - Get out of bed if unable to fall asleep
 - Restrict naps to 30 min in the early afternoon
 - Exercise regularly during the daytime
 - Spend more time outside, without sunglasses, especially late in the day
 - Increase overall light exposure
 - Avoid caffeine, tobacco, and alcohol after lunch

Sleep Hygiene

- Limit liquids in the evening
- Eliminate loud noise, excessive light and uncomfortable room temperature
- Have a light snack before bed
 - Warm milk
 - Foods high in tryptophan, such as bananas
 - Carbohydrates, which are sleep promoting
 - Avoid proteins, which promote wakefulness
- Regular exercise (earlier in the day)
- Give yourself approx. 1 hour to “wind down” before going to bed
- Take a warm bath before going to bed



"No wonder you have insomnia . . .
lying there awake all night."

Questions