



A GUIDE TO SLEEP FOR CRNAS

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LEARNING OBJECTIVES

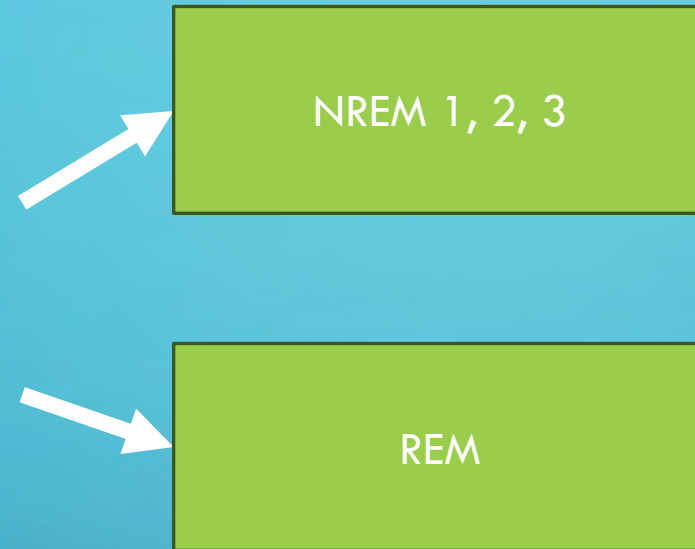
- **Describe the physiology of normal sleep in adults**
- **Differentiate between different stages of sleep and their importance**
- **Discuss sleep disorders**
- **Explain the effects of sleep deprivation on professional CRNA performance**
- **Identify ways to incorporate sleep into busy lives**

WHAT IS SLEEP?

- **State of unconsciousness -- brain is more responsive to internal than external stimuli.**
- **Predictable cycling of sleep and the reversal of relative external unresponsiveness are features distinguishing sleep from other states of unconsciousness.**
- **Brain gradually becomes less responsive to visual, auditory, somatosensory, and other environmental stimuli during the transition from wake to sleep, which is considered by some to be stage I of sleep.**



SLEEP STAGES



<https://www.sleepfoundation.org/stages-of-sleep>

SLEEP STAGES ARE DIFFERENTIATED BASED PRIMARILY ON BRAIN WAVE CHANGES ON EEG, BUT ALSO THE DIFFICULTY OF AROUSAL---MORE DIFFICULT TO AROUSE = DEEPER SLEEP. REM = RAPID EYE MOVEMENT SLEEP; NREM = NON - RAPID EYE MOVEMENT SLEEP

NREM SLEEP

- NREM divided into progressively deeper stages.
- Wakefulness = low-voltage, fast EEG pattern
- NREM 1 & 2 lighter stages. NREM 1 (transition between wake and sleep) decrease in alpha → NREM 2 spindles, K-complexes →
- NREM 3 Increasing amplitude and regularity of delta rhythm (delta waves most often found in young humans, and are associated with deepest levels of relaxation and restorative, healing sleep)
- N1 (2-5% of sleep time); N2 (45 – 55%); N3 (10-20%); REM (20-25%)—4-5 episodes

REM SLEEP

- REM sleep characterized by decreased EEG amplitude, muscle atonia (paralysis!), autonomic variability, and episodic eye movements

- REM has tonic and phasic components

Phasic: sympathetically-driven state; REMs; distal muscle twitches; cardiorespiratory variability; middle ear muscle activity

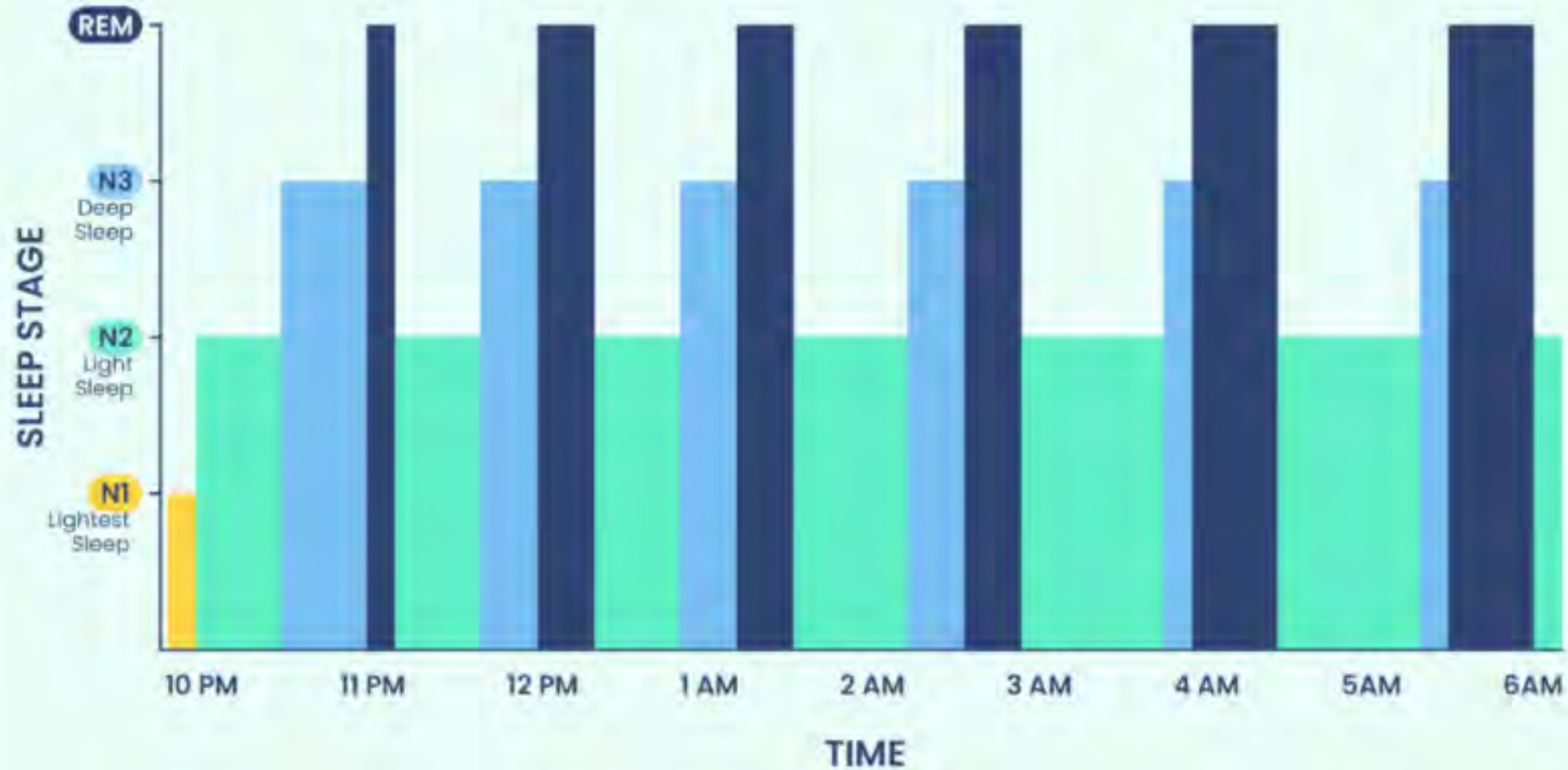
Tonic: parasympathetically driven; no eye movements, decreased EEG amplitude and atonia

- REM period length and density of eye movements increase through-out sleep cycle; 10 min early sleep to 60 minutes later sleep.

SLEEP CYCLE (NREM – REM OCCURENCES)

- NREM-REM cycles vary in length from 70 – 100 min initially → 90 – 120 min later in the night.
- NREM 3 stage is present more first 1/3 of night;
REM sleep predominates last 1/3 of night

Sleep Cycles Through the Night



Sun E, Singh, A. States of Sleep: What Happens in a Sleep Cycle

<https://www.sleepfoundation.org/stages-of-sleep>. Accessed 4-16-2024

● Prefrontal Cortex, PFC
Glutamate, GABA, α_2 , 5-HT_{2A}, MT₁

● NUCLEI ACTIVE DURING WAKEFULNESS

Lateral Hypothalamus, LH
GABA, OX₁, OX₂, MT₁

Tubero Mammillary Nucleus, TMN

H₁

Ventral Tegmental Area, VTA

DAT, D₂

Locus Coeruleus, LC

NET, 5-HT_{2A}, α_2 , MT₁

Dorsal raphe, DR

5-HTT, 5-HT_{2A}, 5-HT_{1A}, MT₁, MT₂

● NUCLEI OF TRANSITION

Suprachiasmatic Nucleus, SCN
(from wakefulness to NREM)

MT₁, MT₂

Ventrolateral Periaqueductal Grey Area, VIPAG
(from NREM to REM)

GABA, Glutamate, MT₂

● NUCLEI ACTIVE DURING NREM

Reticular Thalamus, RT

GABA, MT₂

Ventrolateral Preoptic Area, vlPO

GABA, Galanin

● NUCLEI ACTIVE DURING REM

Basal Forebrain, BF

Ach, MT₁

Sublaterodorsal Nucleus, SLD

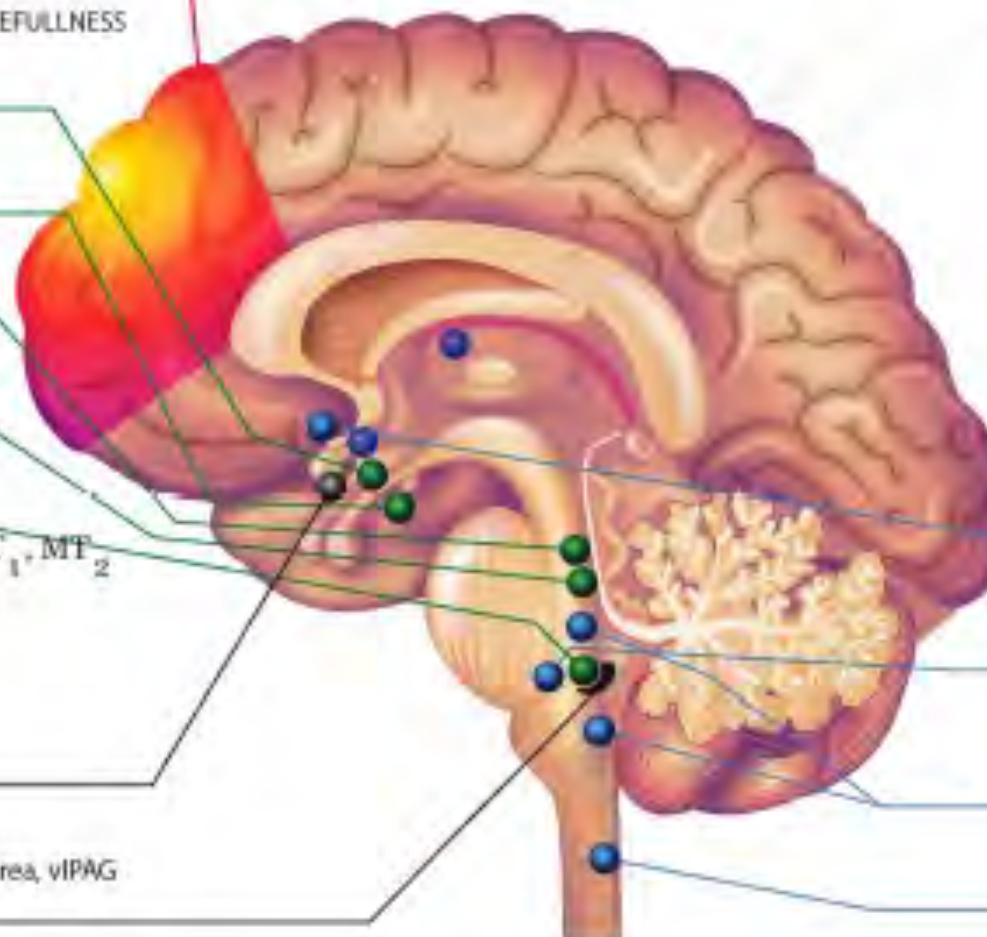
Ach, Glutamate

Laterodorsal Tegmentum, LDT &
Pedunculopontine Tegmentum, PPT

Ach, GABA, Glutamate

Ventromedial Medulla, VM

GABA, Glycine



Brain Areas involved in sleep. From: Gobbi G & Comai S. Differential function of melatonin MT1 and MT2 receptors in REM and NREM Sleep. (2019). *Frontiers in Endocrinology*. Vol 10, Article 87. DOI: 10.3389/fendo.2019.00087

SLEEP DEPRIVATION—HOW MUCH IS ENOUGH?

- Full function of sleep not known; is it to help the brain to rest and recover?
- Evacuate toxins from brain tissue? Glial wash?
- Sleep: body repairs injuries
- Battery Theory: brain recharges during sleep, discharges awake?
- Absolute optimum sleep requirements not known: range ~5 – 8 hr...? Individual variation
- Total sleep depr. = one full night lost to sleep (Busy 24 hr call? ER visit?)
- Partial sleep depr. = reducing the amt of nighttime sleep preventing individuals from obtaining usual sleep time (Partying? Studying? Babies? Worries?)



AVERAGE Sleep Requirement by Age*

- **Older adults (65+):** 7–8 hours
- **Adults (18–64 years):** 7–9 hours
- **Teenagers (14–17 years):** 8–10 hours
- **School children (6–13 years):** 9–11 hours
- **Preschoolers (3–5 years):** 10–13 hours (including naps)
- **Toddlers (1–2 years):** 11–14 hours (including naps)
- **Infants (4–12 months):** 12–15 hours (including naps)
- **Newborns (0–3 months):** 14–17 hours

*Experts agree that these requirements also vary greatly among individuals; genetics and environment both influence sleep needs

EFFECTS OF SLEEP DEPRIVATION



- Higher order cognition affected early and disproportionately
- Speed, accuracy is slowed
- Sleep reduced to 5, then 3 hrs/week → increased accidents; loss of appreciation of peripheral and centrally presented visual stimuli
- Judgment impairment, increasingly risky behaviors occur—why?? Theories:
- Microsleep—brief runs of delta/theta waves, breaking thru normal beta/alpha EEG waking state
- Decreased metabolism in pre-frontal and parietal association areas critical for judgment, high order cognition

OTHER EFFECTS OF SLEEP DEPRIVATION

- Contributes to weight gain, metabolic dysfunction
- Disrupts hormonal circadian rhythms
TSH, cortisol, GH
- Dysregulated glucose metabolism
- Chronic sleep depr linked to cerebrovascular disease, stroke
- Chronic headaches, including migraine, tension HA
- Immune dysfunction, increased susceptibility to infection



WHAT CAN HELP US TO SLEEP?



- Limit daytime naps (if only naps were possible...)
- No caffeine after 12 N; before bed
- Bedtime same time every night
- Wake up same time every day
- Stick to sleep schedule during vaca
- Avoid heavy meal before bedtime
- Spend an hr before bed relaxing activities → read; meditate; bath (if only.....)
- Refrain from electronics an hour before bed (if only....)
- Exercise regularly, but not close to bedtime
- Reduce alcohol intake

SLEEP DISORDERS

- Obstructive Sleep Apnea
- Insomnia
- Narcolepsy-hypersomnolence
- Sleep-related movement disorders—restless legs syndrome
- Parasomnias: Sleep terrors; sleepwalking; sleep-related eating disorder

OBSTRUCTIVE SLEEP APNEA

- As sleep ensues, so does progressive upper airway obstruction
- Intermittent apnea occurs (Apnea Hypopnea Index = no. apneic events per hour) < 5 normal; 5-15 mild; 15-30 mod; > 30/hr severe.
- All night, person has intermittent hypercapnia and hypoxemia
- STOP BANG* < 3 low; > 3 hi likelihood OSA
- Avoid surgery in OPSU setting, danger postop opioid meds, monitor postop
- CPAP device use helps
- Assoc with obesity, DMII, CVD, HTN

STOP-BANG Index---Snoring; Tired during day; Observed Apnea; Pressure hi [Htn]; BMI>35; Age>50;Neck circum > 40 cm; Gender male

INSOMNIA

- 10% population. Causes related to environmental; genetic; psychological; and behavioral
- Leads to HYPERAROUSAL
- TREATMENTS---Cognitive-behavioral therapy. Set of psych/behavioral techniques—relaxation, meditation, breathing exercises.
- Sleep Hygiene: control light, noise, temperature.
- Avoid nicotine, caffeine, alcohol
- Regular exercise.
- Restful bedroom environment
- Regular sleep/wake times
- Avoid daytime naps

INSOMNIA TREATMENTS AND PHARMACOLOGY AND CRNA PRACTICE

- H-1 antihistamines—
diphenhydramine
 - Benzodiazepines
 - Zolpidem (Ambien); zaleplon
(Sonata)
 - Surorexant (belsomra)
- All of these drugs cause hangover
sedation, sleepiness and altered
reaction time and cognitive skills

CRNAS AND SLEEP

- We need sleep adequate to our individually-determined needs---to be at our best for patient care
- You know what those are from living in your body
- 5 hours or 6 hours or 7 hours or 8 hours....
- Talking about **S L E E P**—not dozing in front of a screen.....



CRNAS AND SLEEP: WHEN YOU HAVE TO **WORK** THE NEXT **DAY**→

- Don't drink coffee or ETOH close to bedtime. Don't look at screens. Don't overeat. Don't work in bed.
- Do have a regular bedtime. Wake up same time every day
- Work it out with your family and friends: I gotta work. You have to help me get rest and sleep so I can take care of people.
- If you have insomnia or a sleep disorder: see a professional and get a sleep hygiene and health plan going

SLEEP AND WELLNESS.....

- Rest, relaxation and S L E E P are an integral part of that great idea known as “WELLNESS”
- The World Health Organization (WHO) defines health as “the state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity”.
- Yes-hang glide, skydive, marathon, bike ride, Disneyland, etc etc etc
- BUT—also rest, relax and get your **S L E E P!!!!**

BE WELL EVERYBODY! THANK YOU FOR YOUR ATTENTION!!

CANA WELLNESS COMMITTEE → EMAIL US IF
YOU NEED HELP
INFO@CANAINC.ORG



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