When you sleep, your body rests and restores its energy levels.

A good night’s sleep is often the best way to help you cope with stress, solve problems, or recover from illness.

5 Stages of sleep

1. Transition between consciousness and sleep
2. Move to Stage 2 after 45 minutes
3. Body makes REM
4. Body temperature & BP decreases
5. REM sleep suppresses dreams after first feeding period

1. Normal sleep: high levels of brain activity & breathing rate
2. Sleep architecture: brain activity & breathing rate regulated by hypothalamus
3. After another 90 minutes, move into Stage 3
4. Return to Stage 2
5. Wake up after 90 minutes
Brain Injury on Acute

- Monitors beeping
- Vital signs q2 or at times more frequent
- Frequent lab draws
- Testing
- Medication Administration ATC
- Sleep routine is interrupted
- Procedures/Operations

Rehabilitation

- First job when we get patients to rehab is to get them sleeping better
  - Often we don’t have to do anything for agitation other than getting them to sleep!
  - Patients who do not sleep are not able to participate in therapy
Common medications that can disrupt sleep

- Neurostimulants
  - Amantadine
  - Provigil
  - Bromocriptine
  - Ritalin
  - Caffeine

Neurostimulants and Sleep

- Why do neurostimulants disrupt sleep?
- Are we dosing them appropriately?
  - Often dosed as BID but that means we are giving them at night which is not appropriate
  - 7am and 12pm work well
- Other drugs can also disrupt sleep – steroids, Vitamin B, Opioids (they can cause sleep apnea)
- SSRIs (eg, fluoxetine, paroxetine, and sertraline) increase wakefulness after sleep onset and decrease the total sleep time
- Alcohol – increases awakenings

Sleep Disorders

- Sleep Apnea
  - Obstructive
    - throat relaxes
  - Central
    - occurs when the brain doesn’t send proper signals to the muscles that control breathing
- TBI-associated sleep dysregulation
- Insomnia
- Hypersomnias
- Hyposomnias
Sleep disorder rates after TBI

- Difficulty sleeping after a TBI is one of the most common comorbidities.
- University of Maryland showed a 68% prevalence sleep wake disturbances in patients with closed head injuries.
- 25% of TBI patients will have insomnia that can occur either at the start of the night (sleep onset insomnia) or in the middle of the night (sleep maintenance insomnia).

Sleep and Traumatic Brain Injury

- Insomnia
  - Difficulty with falling asleep or staying asleep
  - Insomnia can worsen other problems resulting from BI, including behavioral and cognitive difficulties.
  - Typically worse after initial insult but then can improve over time
- Excessive Day Time Sleepiness
  - Extreme drowsiness
- Delayed Sleep Phase Syndrome
  - Mixed-up sleep patterns
- Narcolepsy
  - Falling asleep suddenly and uncontrollably during the day

Sleep Syndromes

- Restless Leg Syndrome (RLS)
  - Urge to move legs because they feel uncomfortable, especially at night or when lying down.
- Bruxism
  - Grinding or clenching teeth
- Periodic Limb Movement Disorder (PLMD)
  - Involuntary movement of the arms and legs during sleep
- Sleepwalking
  - Walking or performing other activities while sleeping and not being aware of it
Nursing Interventions for Sleep disorders Following Brain Injury

Non-pharmacologic Interventions

- Scheduled sleep
  - Going to bed at the same time every night
  - Keep the same bedtime routine
- Create a restful atmosphere
  - Low or no lighting
  - No TV or radio
  - No visitors at bedtime
  - Limit noise
- Limit caffeine and sugar 5 hours before bed
- Eat only a snack before bed. Avoid eating large meals.
- Toileting before the sleep
- Limit liquids close to bedtime

Pharmacologic Interventions

- Trazodone
- Nonbenzodiazepine Hypnotics
- Melatonin/Melatonin Agonists
- Benzodiazepines

Trazodone

- Trazodone is a multifunctional drug with dose-dependent pharmacologic actions.
  - Hypnotic actions at low doses due to blockade of 5-HT2A receptors (serotonin receptors), as well as H1 histamine receptors and α1 adrenergic receptors.
  - Higher doses recruit the blockade of the serotonin transporter (SERT) and turn trazodone into an antidepressant
- Cheaper than other sleep medications—$3 compared to $30-45
- Trazodone has biphasic elimination, with a redistribution half-life of about one hour and an elimination half-life of 10-12 hours.
  - Trazodone is nearly completely metabolized hepatically by hydroxylation and oxidation to metabolites that are probably inactive
- Side effects: cardiac arrhythmias and priapism
Melatonin

- Melatonin is a natural hormone that is produced by your body. It plays a role in telling the body and brain when it is time to sleep.
- The most common melatonin side effects include:
  - Daytime sleepiness
  - Dizziness
  - Headaches

Mayo Clinic Zolpidem research study

- “Zolpidem Is Independently Associated with Risk of Inpatient Falls”
  - Journal of Hospital Medicine, Jan 2013
- Mayo clinic study
- Inpatient cohort
- Revealed that zolpidem administration is associated with increased risk of falling
  - even after accounting for insomnia, delirium, and multiple other risk factors
- Mayo clinic has removed Zolpidem from their pharmacy completely
Zolpidem Side Effects

- Sleep-driving
  - Several cases have been found to have injured themselves severely
- Sleep-eating
  - Found to eat things that they would never eat while awake.
  - As a result serious injuries from consuming raw meat, non-edible objects and user cutting themselves while attempting to prepare foods.
- Common side effects: diarrhea, nausea, dizziness, headaches and memory loss.

Summary

- Assess sleep early
- Ambien + TBI=multiple falls and memory loss
- Begin a bed time routine as soon as possible
- Administer Neurostimulants early in the day
- Low stimulation environment at all times

Questions?