Review of Sleep Disorders

1. Basics of Sleep
2. Classification of Sleep Disorders
3. Description of Sleep Disorders
4. Interaction with Narcolepsy
Basics of Sleep

- Until the middle of the 20th century, sleep was believed to be a passive process.
- With new scientific discoveries, it was discovered to be far more active than previously.
- Sleep goes through different phases:
  - Sleep stages;
  - Sleep/wake cycles.
What Is Sleep?

- Not a simple question
- It is described by behavior
- It is measured through physiology
What Is Sleep?

- Behavioral state
  - Reversible state of relative disengagement from and relative unresponsiveness to the environment.
  - Sleep goes through predictable cycles and stages.
What Is Sleep?

- Behavioral state
  - Variable associated behaviors
    - Setting
    - Posture
    - Timing
  - Many of these are species specific
  - Culture has a major influence
What Is Sleep?

- Physiological State
  - Change in physical functions
    - Usually decreased activity
    - Increased activity in some stages
How Sleep is Measured?

- Brain activity-electroencephalography (EEG)
- Eye Movements-electrooculography (EOG)
- Muscle Activity-electromyography (EMG)
How Sleep is Measured?

Polysomnography
Sleep Stages

- REM (rapid eye movement) Sleep
  - Dreaming
    - 90% of dreaming
  - Paralysis
    - Eye muscles active
    - Diaphragm active
    - Muscle twitches
Sleep Stages

- NonREM Sleep
  - Decreasing physiological activity
  - Relatively passive
  - 10% of dreaming
Circadian Rhythm (near day)

- Biological clock
  - Slightly longer than 24 hours
  - Varies
    - Within species
    - Between species

- External cues
  - Clocks
  - Lights
  - Appointments
  - Shifts
  - Media
Circadian Rhythm

**Affects**

- Sleep wake cycle
- Body temperature
- Hormone secretion
- Virtually all body functions
Circadian Rhythm
Sleep Cycles

Stages

W  R  N1  N2  N3

Time

0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00
Periodic Limb Movements and Restless Legs

Thomas Freedom, M.D.
Classification of Sleep Disorders

- Classes
  - Divided into six categories
- Sleep disorders
  - 59 disorders
- Isolated Symptoms and Normal Variants
  - 9 categories
International Classification of Sleep Disorders, 3rd Edition

- Insomnia
- Sleep-related breathing disorders
- Central disorders of hypersomnolence
- Circadian rhythm sleep-wake disorders
- Parasomnias
- Sleep-related movement disorders
- Other sleep disorders
Classification of Sleep Disorders

- **Insomnia**
  - Persistent difficulty with sleep
    - Initiation
    - Duration
    - Consolidation
    - Quality
  - Despite adequate
    - Opportunity and
    - Circumstances for sleep
  - Results in some form of daytime impairment
Classification of Sleep Disorders

- **Insomnia**
  - Chronic Insomnia Disorder
    - Lasts 3 or more months
  - Short-Term Insomnia Disorder
  - Other Insomnia Disorder
Classification of Sleep Disorders

- Sleep Related Breathing Disorders
  - Characterized by abnormalities of respiration during sleep;
  - In some of these disorders, respiration is also abnormal during wakefulness.
Classification of Sleep Disorders

- **Obstructive Sleep Apnea Disorders**
  - Decrease or cessation of airflow despite respiratory effort

- **Central Sleep Apnea Syndromes**
  - Decrease or cessation or respiratory effort

- **Sleep Related Hypoventilation Disorders**
  - Insufficient sleep related ventilation, resulting in elevated arterial carbon dioxide during sleep
  - In some cases can occur while awake

- **Sleep Related Hypoxemia Disorder**
  - Decrease in oxygen during sleep in the absence of another sleep-related breathing disorder
Classification of Sleep Disorders

- Central Disorders of Hypersomnolence
  - Daytime sleepiness
    - Difficulty staying awake and alert during the day resulting in
      - periods of irrepresible need for sleep or
      - unintended lapses into drowsiness or sleep
    - This can vary in severity and is more likely to occur in sedentary, boring, and monotonous situations.
Classification of Sleep Disorders

- Central Disorders of Hypersomnolence
  - Some patients are aware of increasing sleepiness before falling asleep.
  - Others can fall asleep with little or no warning having "sleep attacks".
    - There can be a higher risk of motor vehicle accidents.
  - In some hypersomnias, there are large increases in total daily amount of sleep without any feeling of restoration.
  - In others, sleepiness can be relieved temporarily by naps but reoccurs later.
Classification of Sleep Disorders

- Central Disorders of Hypersomnolence
  - Narcolepsy Type 1
  - Narcolepsy Type 2
  - Idiopathic Hypersomnia
  - Kleine-Levin Syndrome
  - Hypersomnia Due to a Medical Disorder
  - Hypersomnia Due to a Medication or Substance
  - Hypersomnia Associated with a Psychiatric Disorder
  - Insufficient Sleep Syndrome
Classification of Sleep Disorders

- Circadian Rhythm Sleep-Wake Disorders
  - Circadian rhythms are internal “clocks” with near-24-hour rhythms that exist in all living organisms.
  - In humans, these are genetically determined and typically is slightly longer than 24 hours.
  - In order to remain synchronized, the internal rhythm must be reset each day to the 24-hour clock time.
  - For optimal sleep, the actual sleep time should match the timing of the circadian rhythm of sleep and wake propensity.
Classification of Sleep Disorders

- **Circadian Rhythm Sleep-Wake Disorders**
  - Recurrent or chronic patterns of sleep and wake disturbance resulting from disruption of the internal circadian timing system or a misalignment between the timing of the circadian rhythm and the 24-hour environment.
  - A circadian rhythm sleep-wake disorder (CRSWD) may consist of impairment of the internal time-keeping system, its synchronizing mechanisms, or a misalignment of a normal internal rhythm with the external environment.
  - Most CRSWDs arise when a misalignment exists between the internal rhythm and the required timing of school, work, or social activities.
Classification of Sleep Disorders

- **Circadian Rhythm Sleep-Wake Disorders**
  - Delayed Sleep Wake Phase Disorder
  - Advanced Sleep-Wake Phase Disorder
  - Irregular Sleep-Wake Rhythm Disorder
  - Non-24-Hour Sleep-Wake Rhythm Disorder
  - Shift Work Disorder
  - Jet Lag Disorder
  - Circadian Sleep-Wake Disorder Not Otherwise Specified (NOS)
Classification of Sleep Disorders

- Parasomnias
  - Undesirable physical events or experiences that occur as one is going to sleep, while sleeping, or during arousal from sleep
  - May occur during non-rapid eye movement sleep (NREM), rapid eye movement sleep (REM), or during transitions to and from sleep
  - Can consist of abnormal complex movements, behaviors, emotions, perceptions, dreams, and autonomic nervous system activity
  - Can result in injuries, sleep disruption, adverse health effects, and untoward psychosocial effects.
  - This can affect the patient, the bed partner, or both.
Classification of Sleep Disorders

- Parasomnias
  - NREM-Related Parasomnias
    - Disorders of Arousal (From NREM Sleep)
    - Confusional Arousals
    - Sleep walking
    - Sleep Terrors
    - Sleep Related Eating Disorder
  - REM-Related Parasomnias
    - REM Sleep Behavior Disorder
    - Recurrent Isolated Sleep Paralysis
    - Nightmare Disorder
  - Other Parasomnias
    - Exploding Head Syndrome
    - Sleep Related Hallucinations
    - Sleep Enuresis
    - Parasomnia Due to a Medical Disorder
    - Parasomnia Due to a Medication or Substance
    - Parasomnia, Unspecified
Classification of Sleep Disorders

- **Sleep Related Movement Disorders**
  - Primarily relatively simple, usually stereotyped, movements that disturb sleep or its onset
  - Nocturnal sleep disturbance, or sleepiness or fatigue
  - Body movements that disturb sleep also are seen in parasomnias, but differ from the simple stereotyped movements in sleep related movement disorders.
Sleep-Related Movement Disorders and Narcolepsy

- **Sleep Related Movement Disorders**
  - Some movement disorders may occur during both sleep and wakefulness.
  - Many normal sleepers exhibit episodes of movements of sleep.
    - They should not be classified as having sleep-related movement disorder.
Classification of Sleep Disorders

- **Sleep Related Movement Disorders**
  - Restless Legs Syndrome
  - Periodic Limb Movement Disorder
  - Sleep Related Leg Cramps
  - Sleep Related Bruxism
  - Sleep Related Rhythmic Movement Disorder
  - Benign Sleep Myoclonus of Infancy
  - Propriospinal Myoclonus at Sleep Onset
  - Sleep Related Movement Disorder Due to a Medical Disorder
  - Sleep Related Movement Disorder Due to a Medication or Substance
  - Sleep Related Movement Disorder, Unspecified
Insomnia and Narcolepsy
Insomnia and Narcolepsy

- One of the cardinal features of Narcolepsy is disrupted nocturnal sleep
- Sleep can be disrupted by:
  - Arousals/Awakenings,
  - Increased stage N1 (lighter sleep),
  - Frequent stage-shifts,
  - Hypnagogic/hypnopompic hallucinations,
  - Sleep paralysis,
  - Dreams, especially nightmares,
  - Medications.
Insomnia and Narcolepsy
Sleep-Related Breathing Disorders and Narcolepsy

- **Obstructive sleep apnea (OSA)**
  - Repetitive episodes of complete (apnea) or partial (hypopnea) upper airway obstruction during sleep
    - Snoring
    - Gasping
    - Choking
    - Body movement
Sleep-Related Breathing Disorders and Narcolepsy

Obstructive Sleep Apnea Symptoms and consequences

- Sleepiness
- Insomnia
- Unrefreshing sleep
- Poor sleep quality
- Fatigue
- Heart disease
- Stroke
Sleep-Related Breathing Disorders and Narcolepsy

- **Obstructive Sleep Apnea Syndrome**
  - 3% to 7% of adult men
  - 2% to 5% of adult women
  - All age groups, but increased frequency with age
Sleep-Related Breathing Disorders and Narcolepsy

- **Obstructive Sleep Apnea Risk Factors**
  - Excess body weight
  - Upper airway structural abnormality
    - Facial abnormalities
    - Adeno-tonsillar enlargement
  - Hormonal disorders
  - Nasal obstruction
  - Worsened by alcohol and sedating medications
Sleep-Related Breathing Disorders and Narcolepsy

- Studies show 9 to 21% of people with narcolepsy have OSA.
- It is possible that Xyrem can worsen sleep apnea in some people with narcolepsy.
- If symptoms of narcolepsy worsen, especially if snoring is present, evaluation for sleep apnea should be considered.
Central Disorders of Hypersomnolence

Narcolepsy

1. Excessive daytime sleepiness
2. Cataplexy
3. Hypnic Hallucinations
4. Sleep Paralysis
5. Disrupted Nocturnal Sleep
Circadian Rhythm Sleep-Wake Disorders and Narcolepsy

- The secretion of melatonin may be altered in people with narcolepsy and low hypocretin/orexin levels.
- 24 hour temperature cycle is probably preserved, but temperature minimum may occur earlier than in people without narcolepsy.
- Skin temperature regulation in the day may be impaired.
Circadian Rhythm Sleep-Wake Disorders and Narcolepsy

- Overall circadian rhythm is preserved.
- Some alteration of temperature regulation may occur.
- There may be an advanced phase in Narcolepsy.
Advanced Sleep-Wake Phase Disorder

- Earlier timing of the major sleep episode
  - Sleep onset and awakening occur earlier than required or desired times.
  - Affected individuals complain of early morning awakening and early evening sleepiness.
  - When affected individuals are allowed to sleep with advanced schedule, quality and quantity of sleep are improved.
Parasomnias and Narcolepsy

- Parasomnia symptoms in common with narcolepsy
  - Sleep paralysis
  - Hallucinations
  - Dream enactment (Rem without atonia)
  - With Xyrem
    - Sleep driving
    - Sleep-related eating
    - Catathrenia (sleep related groaning)
- Lucid dreaming
- Nightmares
Parasomnias and Narcolepsy

- **REM Sleep Behavior Disorder (RBD)**
  - Abnormal behaviors emerging during REM sleep
  - Sleep disruption and sleep related injury can occur with RBD
  - An attempted enactment of unpleasant, action-filled, and violent dreams in which the individual is being confronted, attacked, or chased by unfamiliar people or animals.
  - Typically, at the end of an episode, the individual awakens quickly, becomes rapidly alert, and reports a dream with a coherent story.
  - The dream action corresponds closely to the observed sleep behaviors.
  - Can be at risk for developing Parkinson’s disease in the future
Parasomnias and Narcolepsy

- Dream enactment
  - Similar to REM-sleep behavior disorder
  - Differs as there is no risk of developing Parkinson Disease
  - May occur in up to 1/3 of people with Narcolepsy
  - Loss of muscle paralysis that normally occurs in REM sleep may occur in up to 50% of people with Narcolepsy.
Sleep-Related Movement Disorders and Narcolepsy
Sleep-Related Movement Disorders and Narcolepsy

- **Restless Legs Syndrome (RLS)**
  Also known as Willis–Ekbom disease (WED)
  1. An urge to move the legs usually with discomfort in the legs.
  2. The urge to move the begin or worsen during periods of rest or inactivity.
  3. The urge to move the legs and any accompanying unpleasant sensations are partially or totally relieved by movement.
  4. The urge to move the legs rest only occurs or is worse in the evening or night than during the day.
  5. The occurrence of the above features is not solely accounted for as symptoms primary to another medical or a behavioral condition.
Sleep-Related Movement Disorders and Narcolepsy

Restless Legs Syndrome (URGE)

1. Urge to move the limbs
2. At Rest
3. Relieved by activity (Get up and Go)
4. Worse in the Evening
Sleep-Related Movement Disorders and Narcolepsy

- **Restless Legs Syndrome (RLS)**
  - Studies show higher prevalence in people with Narcolepsy, from approximately 15 to 20%.
  - Can lead to disrupted sleep
  - Association with sleep walking has been reported.
  - Can make napping more difficult
  - Possibly triggered by Xyrem
Sleep-Related Movement Disorders and Narcolepsy

- **Periodic Limb Movement Disorder (PLMD)**
  - Rapid repetitive twitches
  - Usually in lower extremities
  - Can disrupt sleep and/or cause daytime sleepiness
Periodic Limb Movement Disorder

- Complaints of insomnia, excessive daytime sleepiness, and/or repetitive limb movements which disturb their sleep
- Bed partners may observe or be disturbed by movements
- Have frequent leg movements on sleep studies which cause or are followed by arousals
Sleep-Related Movement Disorders and Narcolepsy

- **Periodic Limb Movement Disorder**
  - Most frequent during lighter stages of nonREM sleep and less during deeper stages;
  - Usually absent in REM sleep except in people with Narcolepsy and REM sleep behavior disorder.
Sleep-Related Movement Disorders and Narcolepsy

- **Periodic Limb Movement Disorder**
  - Occur frequently in Narcolepsy
  - Can increase arousals from sleep-worsening sleep disruption
  - May occur more frequently in REM sleep
  - Can occur in the absence of RLS
  - May be exacerbated by Xyrem
Sleep-Related Movement Disorders and Narcolepsy

Periodic Limb Movement Disorder
Classification of Sleep Disorders

- There are many sleep disorders.
- Some of these disorders share symptoms common to Narcolepsy.
- Other sleep disorders occur more frequently in people with Narcolepsy.
- On occasion, some treatments for Narcolepsy may trigger or exacerbate these conditions.
- It is important to be aware of these symptoms as they may worsen Narcolepsy and potentially risk other medical disorders.
- Treating them may help to improve the management of Narcolepsy and reduce risk for other medical disorders.
Questions?