Sleep Stages

Full Educational Lecture Script

Good evening.

Today we will discuss one of the most fundamental topics in sleep medicine:

Sleep Stages

Every night, your brain cycles through different stages of sleep, each serving a unique purpose in physical restoration, memory processing, emotional regulation, and overall health.

Sleep is not one continuous state.

It is a highly organized process made up of multiple stages that repeat throughout the night.

Why Do We Sleep in Stages?

Different sleep stages perform different functions.

Some stages are important for:

- Physical recovery
- Hormone release
- Immune function

Others are critical for:

- Learning
- Memory
- Emotional processing

The Two Main Types of Sleep

Sleep is divided into:

Non-REM Sleep (NREM)

and

REM Sleep

Throughout the night, the brain cycles repeatedly between these states.

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Sleep Architecture

A normal adult experiences:

- 4–6 sleep cycles per night
- Each cycle lasts approximately 90–120 minutes

Each cycle contains:

- N1
- N2
- N3
- REM

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Stage N1 Sleep

Light Sleep

N1 is the transition from wakefulness to sleep.

Characteristics:

- Very light sleep
- Easily awakened
- Slow eye movements
- Reduced muscle activity

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EEG Findings

During N1:

- Alpha activity decreases
- Theta activity appears

This is often the first stage scored after lights out.

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Clinical Features

Patients may experience:

- Drifting thoughts
- Feeling of falling
- Sudden muscle jerks

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Hypnic Jerks

Many people experience:

Hypnic Jerks

These are sudden muscle contractions that occur as sleep begins.

They are normal.

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Stage N2 Sleep

Stable Sleep

N2 represents the largest portion of sleep in most adults.

Typically:

- 45–55% of total sleep time

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EEG Characteristics

N2 contains two hallmark findings:

Sleep Spindles

and

K-Complexes

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Sleep Spindles

Sleep spindles are:

- Brief bursts of brain activity
- 11–16 Hz

Thought to help:

- Memory consolidation
- Sensory filtering

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K-Complexes

K-complexes are:

- Large biphasic EEG waves

Thought to represent:

- Sleep protection mechanisms

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What Happens During N2?

Heart rate slows.

Body temperature decreases.

Breathing becomes more regular.

The brain becomes less responsive to external stimuli.

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Stage N3 Sleep

Deep Sleep

N3 is also called:

- Slow-wave sleep
- Deep sleep

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EEG Characteristics

Dominated by:

Delta Waves

Large amplitude, slow-frequency brain activity.

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Why Is N3 Important?

N3 is the most restorative stage.

Functions include:

- Physical recovery
- Tissue repair
- Immune support
- Growth hormone release

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Growth Hormone Release

Most growth hormone secretion occurs during:

N3 Sleep

This is critical for:

- Muscle repair
- Metabolism
- Recovery

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Arousal Threshold

N3 has the highest arousal threshold.

Patients are difficult to awaken.

If awakened:

- Groggy
- Confused
- Disoriented

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Parasomnias and N3

Many parasomnias occur during N3:

- Sleepwalking
- Sleep terrors
- Confusional arousals

These occur because the brain is partially awake and partially asleep.

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REM Sleep

Rapid Eye Movement Sleep

REM sleep is one of the most fascinating states of consciousness.

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Why Is It Called REM?

Because of:

Rapid eye movements

seen beneath closed eyelids.

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Brain Activity During REM

The brain becomes highly active.

EEG resembles wakefulness.

This is often called:

Paradoxical Sleep

Because:

- Brain appears awake
- Body remains asleep

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REM Atonia

One of the defining features of REM:

Muscle paralysis

Nearly all skeletal muscles become inactive.

This prevents us from acting out dreams.

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Dreaming

Most vivid dreaming occurs during REM sleep.

Dreams are often:

- Emotional
- Visual
- Complex

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Memory Processing

REM sleep contributes to:

- Emotional memory
- Learning
- Creativity
- Problem-solving

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REM Across the Night

REM periods increase as the night progresses.

Early night:

- More N3

Late night:

- More REM

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Sleep Cycle Example

Typical progression:

Wake

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N1

↓

N2

↓

N3

↓

N2

↓

REM

↓

Repeat

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Sleep Across the Lifespan

Sleep architecture changes with age.

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Infants

- More REM sleep
- Up to 50% REM

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Adults

- Balanced sleep architecture

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Older Adults

- Less N3
- More awakenings
- Reduced sleep efficiency

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Sleep Efficiency

Sleep efficiency is:

Total Sleep Time ÷ Time in Bed × 100

Normal:

85%

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Sleep Stage Percentages

Typical adult:

N1

2–5%

N2

45–55%

N3

15–25%

REM

20–25%

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Why Sleep Stages Matter

Abnormal sleep architecture may occur with:

- Sleep apnea
- Insomnia
- Narcolepsy
- Depression
- Neurological disease

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Sleep Apnea and Sleep Stages

Obstructive Sleep Apnea

Sleep apnea often causes:

- Reduced N3
- Reduced REM
- Fragmented sleep

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REM Rebound

After sleep deprivation:

Patients may experience:

REM Rebound

An increase in REM sleep.

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Deep Sleep Rebound

Similarly:

N3 may increase after:

- Sleep deprivation
- Recovery sleep

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Why We Need All Sleep Stages

No single stage is enough.

The body requires:

- N1 for transition
- N2 for stability
- N3 for restoration
- REM for memory and emotional health

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Key Clinical Insight

Sleep quality is not determined by hours alone.

The distribution of sleep stages is equally important.

Eight hours of fragmented sleep may be far less restorative than six hours of consolidated sleep.

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Summary

Sleep consists of:

N1

Light sleep

N2

Stable sleep

N3

Deep restorative sleep

REM

Dream sleep and memory processing

Together they form the architecture of healthy sleep.

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Final Message

Every night your brain follows a remarkably organized pattern.

While you sleep:

- Memories are strengthened
- Hormones are released
- Tissues are repaired
- Emotions are processed

Understanding sleep stages helps us understand why sleep is one of the most powerful biological processes in human health

Remote Sleep Scoring - Weekly Newsletters