DESCRIBING NORMAL ADULT SLEEP

1. Sleep Stages

a. Wake

EEG – "beta" rhythm (desynchronous, low voltage, fast rhythm)
18-30 cycles per second or Hertz
EMG – moderate to high
Consciousness – active processing of cognitive information

EEG – "alpha" rhythm (synchronous, moderate voltage, slower rhythm)
8-12 cps/Hz
EMG – low to moderate
Consciousness – relaxed, unfocused, aware of environmental stimuli

b. State 1 Non-REM (NREM) Sleep (light NREM sleep)

EEG – "theta" rhythm (synchronous, moderate voltage, slower rhythm)
6-8 cps/Hz
EMG – low to moderate
Consciousness – unconscious, unaware of stimuli, easy to awaken
EOG – slow, rolling eye movements, not always conjugate

c. Stage 2 NREM Sleep (light NREM sleep)

EEG – "theta" rhythm
"sleep spindles" – 12-14 cps/Hz (synchronous, short bursts)
"K-complexes"
EMG – low to moderate
Consciousness – unconscious, unaware of stimuli, fairly easy to awaken
EOG – no characteristic movements observed

d. Stage 3 NREM Sleep (deep NREM sleep)

EEG – presence of "delta" rhythm (< 50% of record)
(synchronous, high voltage, very slow rhythm)
½ to 3 cps/Hz
EOG – quiet
EMG – very low EKG, respiration, BP – low, steady
Hormones – growth hormone secretion
Consciousness – unconscious, unaware of stimuli, more difficult to awaken

1. **Sleep Stages** (cont.)

e. **Stage 4 NREM Sleep (deep NREM sleep)**

EEG – presence of "delta" rhythm > 50% of record
Same as stage 3, except even more difficult to awaken
When awakened may report vague "dreams"
Many alternate names for this stage of sleep: Slow Wave Sleep (SWS), Quiet Sleep, Synchronous or "S" Sleep

f. **Stage REM (Rapid Eye Movement Sleep)**

EEG – "beta-like" (low voltage, desynchronous, fast frequency)
Presence of "sawtooth" waves
EMG – "flat-line", active inhibition of skeletal muscles (except for those muscles involved in respiration)
Muscle twitches in face, fingers, whiskers
External muscles of eyeball still innervated
Consciousness – unconscious, unaware of environmental stimuli, if awakened will report detailed dreams usually
Relatively easy to awaken sleeper
EOG – bursts of rapid, conjugate eye movements ("REMs")
"Phasic" vs. "Tonic" REM sleep:
Tonic REM – EKG, respiration, BP, GSR, HR – slow, steady, low, no REMs
Phasic REM – EKG, respiration, BP, GSR, HR – erratic, faster, higher, lots of REMs, HCl secreted in stomach
Implies high arousal of SNS
Penile/clitoral tumescence
No temperature regulation (become "poikilothermic" within a limited range of temperatures)
Alternate names: Active Sleep, Desynchronous or "D" Sleep, Dreaming Sleep, Paradoxical Sleep (especially used for animal REM sleep)

2**. Sleeper's Perception of Sleep Stages**: When awaken the sleeper for each stage of sleep, what is his/her impression/perception? Does *S* know that he/she was asleep?

Implications for clinical histories from patients
"Lucid Dreamers"

3. Total Percentages of Different Sleep Stages in a Night

Stage 1 – 5%
Stage 2 – 45-55%
Stage 3&4 – 20%
Stage REM – 20%

4. **Sleep "Architecture" Across the Night's Sleep**

W --- Stage l --- Stage 2 --- Stage 3 --- Stage 4 --- Stage 3 --- Stage 2 --- REM
End of first cycle of sleep
Latency to start of first REM cycle
An expression of the BRAC?
Number of REM cycles in a night

So…REM --- Stage 2 --- Stage 3 --- Stage 4 --- Stage 3 --- Stage 2 --- REM
Latency to start of second REM cycle
First "half" of night: mostly Stages 3 & 4 sleep

Then…REM --- Stage 2 --- Stage 3 --- Stage 2 --- REM
Then…REM --- Stage 2 --- REM --- Stage 2 --- REM --- Stage 2 --- REM --- W
Second "half" of night: mostly Stages 2 and REM
What happens if *S* sleeps for short time? For a longer time?