

**POLICIES & PROCEDURES****SLEEP COHORT STUDY**Date: 4/25

Approved: \_\_\_\_\_

**SCORING GUIDELINES****SLEEP STAGING**

Follow rules in Rechtschaffen and Kales.

<b>Sleep Stage</b>	<b>EEG</b>	<b>EOG</b>	<b>EMG</b>
<b>Stage W</b>	<b>Alpha activity and/or low voltage mixed frequencies</b>	<b>REM's and eye blinks</b>	<b>High tonic EMG</b>
<b>Stage 1</b>	<b>Relatively low voltage, mixed frequency EEG predominantly in the 2-7 Hz range, at about 50-75 uV. Vertex sharp waves up to 200 uV</b>	<b>Slow eye movements of several secs duration. No REM's.</b>	<b>Tonic EMG levels below those of Stage W.</b>
<b>Stage 2</b>	<b>Sleep spindles and/or K-complexes (0.5 sec duration), and absence of sufficient high amplitude to define presence of Stage 3 or 4.</b>		
<b>Stage 3</b>	<b>20% but not more than 50% of epoch consists of 2 Hz or slower waves with amplitude greater than 75 uV peak to peak. Sleep spindles may or may not be present.</b>		
<b>Stage 4</b>	<b>More than 50% of epoch consists of 2 Hz waves or slower with amplitudes &gt; 75 uV peak to peak. Sleep spindles may or may not be present.</b>		
<b>Stage REM</b>	<b>Relatively low voltage, mixed frequency EEG. Presence of "saw tooth" waves in vertex and frontal areas. Alpha activity that is 1-2 Hz slower than wakefulness may be prominent. Absence of K-complexes and sleep spindles.</b>	<b>Tonic mental-submental EMG at lower level than preceding sleep stage.</b>	<b>REM's</b>

**SCORING DECISIONS FOR STAGE TRANSITIONS**

**Stage W vs Stage 1** - When amount of record characterized by alpha activity combined with low voltage activity drops to less than 50% of the epoch and is replaced by relatively low voltage, mixed frequency activity, the epoch is scored as Stage 1.

**Stage 1 vs Stage 2** - If less than 3 min of record which would ordinarily meet the requirements for Stage 1 intervene between sleep spindles and/or K-complexes, these intervening epochs are to be scored Stage 2,

if there is no indication of arousals or increased EMG activity.

If the interval without sleep spindles or K complexes lasts 3 min or longer, the interval is scored as Stage 1, even if it contains no movement arousal.

Stage 2 vs Stage 3 - Epoch must have at least 20% (but not more than 50%) high amplitude waves of 2 Hz or slower to be staged as 3. Measurement may be necessary. An attempt should be made to distinguish between spontaneous K complexes and delta waves.

Stage 3 vs Stage 4 - More than 50% of the epoch must consist of waves 2 Hz or slower and of amplitudes > 75 uV p-p. However, most Stage 4 epochs have the appearance of being completely dominated by this activity. Interval of lower amplitude, faster activity rarely persist for more than a few seconds in Stage 4, but are usually prominent in Stage 3 epochs.

REM Start vs REM End - Refer to R&K, pages 9-11.

## SCORING OF BREATHING EVENTS

### APNEAS

#### Definitions of Apneas

**Obstructive** - No indication of airflow by thermocouple and an indication of effort in Respirance channels.

**Central** - No indication of airflow by thermocouple and no indication of effort in Respirance channels.

**Mixed** - No indication of airflow by thermocouple and areas of no effort followed by effort in Respirance channels.

#### Scoring Procedure

##### 1) Determine if there is flow or no flow.

Criteria for no flow:

a) Does not follow previous pattern of flow

and/or

b) is <25% of amplitude of the largest previous breath (determined by uV/mm of unclipped air flow sensitivity, if necessary)

and

c) has an interruption of airflow that is  $\geq 10$  sec. in duration.

##### 2) Determine if there is effort or no effort.

Criteria for no effort (from Respirance):

a) Does not follow previous pattern of breathing

and

b) has no discernable amplitude of the signal in the Respitrace.

### 3) Measure duration of event

a) Measure from the beginning of the last expiration on the air flow channels to the beginning of the next inspiration on the air flow channels to determine the 10 second criterion.

b) If 10 seconds, measure the duration of the event from the beginning of the last expiration to the beginning of the next inspiration on the sum channel of the Respitrace that best corresponds to the points of measurement of duration in the airflow channels.

c) If not 10 seconds, determine if the event meets the criterion for a hypopnea - 4% desaturation. If it does not, then the event is ignored and not scored.

**NOTE:** When the event is obviously an apnea and is between 9.5 and 10 seconds, round the duration up to 10 seconds and score.

## **HYPOPNEAS**

### Definition

A desaturation of 4% or greater indicated in SaO<sub>2</sub> channel beginning in sleep.

### Scoring Procedure

1) Determine 4% desaturation in sleep.

2) Trace back to page containing respiratory event and record page number with value of nadir of desaturation. If there is no detectable change in air flow previous to the desaturation, record the page with the desaturation nadir.

## SCORING OF LEG MOVEMENTS

### Definition of Leg Movements

A leg movement shall have a minimum duration of 0.5 to 5.0 seconds and have an amplitude of at least 50% of the subject's voluntary leg flexion are recorded during pre-sleep calibrations.

**Example:** Pre-sleep calibration of leg flexion = 2 cm. Amplitude of leg movement EMG must be at least 1 cm to be considered.

**Movements occurring within 4 seconds of each other, are counted as one movement. Movements which are separated by at least 4 seconds are counted as separate movements.**

**Movements that occur during wakefulness are not counted.**

### Definition of Arousal

- 1) The appearance of alpha rhythm within 1 second before or after the movement. The alpha activity must last at least 3 seconds.**
- 2) An obvious change to an ascending sleep stage within 1 second before or after the movement.**
- 3) An increase in submental EMG within 1 second before or after the movement.**
- 4) The appearance of a K-complex, regardless of the sleep stage, within 1 second before or after the movement.**