



**SALTZER**  
MEDICAL GROUP



**IDAHO**  
SLEEP HEALTH

Mark Rasmus, M.D.

## BASELINE POLYSOMNOGRAPHY

DOB: 07/07/48

DOS: 11/03/08

**STANDARD PROTOCOL:** The patient was studied with attended Polysomnography. Electrophysiologic sleep parameters included: frontal (F4/M1 or F3/M2), Central (C4/M1 or C3/M2) and occipital (O2/M1 or O1/M2), electroencephalogram (EEG), right and left electroculogram (EOG), and submentalis electromyogram (EMG). Cardiac rhythm was continually recorded (ECG). Periodic limb movements were monitored by anterior tibialis electromyogram (EMG). Airflow was detected by oronasal thermistor and pressure transducer. Respiratory effort was determined by measurement of chest and abdomen motion using Respiratory Inductance Plethysmography. Arterial pulse oximetry (SpO<sub>2</sub>) was measured with an internal Nellcor OxiMax 3 second sampling rate from the finger. Analog data was digitized, transferred from the hard drive to the local area network, and after being analyzed, the results archived on CD-ROM. Raw data was manually scored in 30-second epochs for sleep stages using AASM Manual for the Scoring of Sleep and Associated Events 2007. Apneas were scored on the basis of absence of airflow from a thermistor for  $\geq 10$  seconds, respectively. Hypopneas were scored on the basis of reduction of nasal pressure amplitude of  $\geq 50\%$ , for a duration of  $\geq 10$  seconds, desaturation of  $\geq 3\%$  below pre-event baseline or the event is associated with arousal and 90 % of event meets amplitude criteria. The Apnea Hypopnea Index (AHI) was computed as a total of all respiratory events divided by the total sleep time in hours.

**REFERRING PHYSICIAN:** David Nielsen, M.D.

**CHIEF COMPLAINT:** Suspected sleep apnea.

**HISTORY OF PRESENT ILLNESS:** This is a 60-year-old male with snoring and witnessed apneas. The patient has 1-3 episodes of nocturia.

**PAST MEDICAL HISTORY:** Diverticulitis. Headaches. BPH. Hernia. Eczema. Dyslipidemia. Bursitis. Schatzki's ring status post dilatation.

### MEDICATIONS:

- 1) Multivitamin.
- 2) Stool softener.

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### PHYSICAL EXAM RISK FACTORS:

BMI: 25.8.  
Neck circumference: 15 ½ inches.  
Class III Mallampati airway.

### TECHNICAL NOTES:

Mild to very loud snoring was noted.  
Three episodes of nocturia were noted.  
The study was excellent.

### MORNING QUESTIONNAIRE:

Estimated sleep latency: 10 minutes, same as usual.  
Total sleep time: 7 ½ hours, same as usual.  
Patient remembered 4 awakenings.  
Patient felt awake and wide alert.  
Overall thought it was a typical night's sleep.

### SLEEP ARCHITECTURE:

Total Sleep Time: 7 hour 1 minute.  
Sleep Onset Latency: 3 minutes 54 seconds.  
Sleep Efficiency: 90.6%.  
REM latency: 2 hours 11 minutes.

Sleep hypnogram reveals dramatically fragmented sleep with 3 distinct REM periods.

Sleep stage distribution: Shows slightly decreased Stage REM sleep.

N1: 13.2% total sleep time  
N2: 62% total sleep time  
N3: 7.5% total sleep time  
REM: 17.3% total sleep time

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### BODY POSITION:

56% of the night spent in the supine position  
44% of the night spent in the non-supine position

### LIMB MOVEMENTS:

Periodic Limb Movement Index is 65.9 events/hour.  
Of the limb movements noted above, 4.1 events/hour are associated with arousals.

Arousal index: 33.5 events/hour.  
Most of the arousals are associated with respiratory events.

### RESPIRATORY:

Total obstructive apneas: 5.  
Total central apneas: 7.  
Total hypopneas: 166.  
Longest apnea: 13.5 seconds.  
Mean duration of apneas: 10.7 seconds.

Apnea Hypopnea Index (AHI): 25.3 events/hour.  
Apnea Hypopnea Index (AHI) during-REM sleep: 17.3 events/hour.  
Apnea Hypopnea Index (AHI) in the supine position: 33.1 events/hour

### OXYGENATION:

Mean SpO<sub>2</sub>: 93.9%.  
SpO<sub>2</sub> nadir: 91%.  
Time spent with saturations less than 90%: 0% of total sleep time

EKG: Normal sinus rhythm.

EEG NOTES: None.

## BASELINE POLYSOMNOGRAPHY

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### CONCLUSIONS:

- 1) Patient has evidence of moderate obstructive sleep apnea with an apnea hypopnea index of 25.3 events/hour and an SpO2 nadir 91%.
- 2) The patient's sleep disordered breathing is no worse in Stage REM sleep or in the supine position.
- 3) The patient has moderate periodic limb movement disorder with associated arousals.
- 4) The patient has markedly abnormal sleep architecture with a significantly elevated arousal index.

### RECOMMENDATIONS:

- 1) CPAP titration in an attempt to correct his underlying obstructive sleep apnea.
- 2) Patient has been called and consultation has been scheduled at Idaho Sleep Health.
- 3) Consider treatment of his periodic limb movement disorder.
- 4) Please feel free to call with any questions.

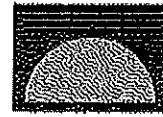
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cc: David Nielsen, M.D.



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SLEEP HEALTH

## MANDIBULAR ADVANCEMENT DEVICE TITRATION

DOB: 04/07/48

DOS: 12/16/09

**STANDARD PROTOCOL:** The patient was studied with attended Polysomnography. Electrophysiologic sleep parameters included: frontal (F4/M1 or F3/M2), Central (C4/M1 or C3/M2) and occipital (O2/M1 or O1/M2), electroencephalogram (EEG), right and left electroculogram (EOG), and submentalis electromyogram (EMG). Cardiac rhythm was continually recorded (ECG). Periodic limb movements were monitored by anterior tibialis electromyogram (EMG). Airflow was detected by oronasal thermistor and pressure transducer. Respiratory effort was determined by measurement of chest and abdomen motion using Respiratory Inductance Plethysmography. Arterial pulse oximetry (SpO<sub>2</sub>) was measured with an internal Nellcor Oximax 3 second sampling rate from the finger. Analog data was digitized, transferred from the hard drive to the local area network, and after being analyzed, the results archived on CD-ROM. Raw data was manually scored in 30-second epochs for sleep stages using AASM Manual for the Scoring of Sleep and Associated Events 2007. Apneas were scored on the basis of absence of airflow from a thermistor for  $\geq 10$  seconds, respectively. Hypopneas were scored on the basis of reduction of nasal pressure amplitude of  $\geq 50\%$ , for a duration of  $\geq 10$  seconds, desaturation of  $\geq 3\%$  below pre-event baseline or the event is associated with arousal and 90 % of event meets amplitude criteria. The Apnea Hypopnea Index (AHI) was computed as a total of all respiratory events divided by the total sleep time in hours.

**REFERRING PHYSICIAN:** Jamison Spencer, DMD

**PRIMARY CARE PHYSICIAN:** David Nielsen, M.D.

**CHIEF COMPLAINT:** Obstructive sleep apnea.

**HISTORY OF PRESENT ILLNESS:** This is a 61-year-old male status post baseline polysomnography on 11/03/08, which showed markedly fragmented sleep and moderate obstructive sleep apnea with an apnea hypopnea index of 25.3 events/hour. The patient had moderate periodic limb movement disorder. The patient then underwent CPAP titration on 11/24/08, which showed reduction in his sleep disordered breathing using CPAP therapy. Once again the patient had markedly fragmented sleep and severe periodic limb movement disorder.

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**PAST MEDICAL HISTORY:** Diverticulitis. Headaches. BPH. Hernia. Eczema. Dyslipidemia. Bursitis. Schatzki's ring status post dilatation.

### MEDICATIONS:

- 1) Multivitamins.
- 2) Stool softener.
- 3) Fish oil.

### PHYSICAL EXAM RISK FACTORS:

BMI: 25.8.  
Neck circumference: 15 ½ inches.  
Class II Mallampati airway.

### TECHNICAL NOTES:

The patient brought 3 separate silence sleep devices into the office. One labeled original, one labeled #1 and one labeled #2. Only silence sleep device is original and #1 were used.  
Two episodes of nocturia were noted.  
Snoring was eliminated using a silence sleep device.

### MORNING QUESTIONNAIRE:

Estimated sleep latency: 15 minutes, same as usual.  
Total sleep time: 7 hours, same as usual.  
Patient remembered 3 awakenings.  
Patient felt well rested in the morning.  
Overall thought it was a typical night's sleep.

### SLEEP ARCHITECTURE:

Total Sleep Time: 417 minutes.  
Sleep Onset Latency: 0.5 minutes.  
Sleep Efficiency: 96.4%.  
REM latency: 111.5 minutes.

Sleep hypnogram revealed relatively consolidated sleep and 4 distinct REM periods.

## MANDIBULAR ADVANCEMENT DEVICE TITRATION

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Sleep stage distribution: Within normal limits.

N1: 5.3% total sleep time  
N2: 54.1% total sleep time  
N3: 17.6% total sleep time  
REM: 23% total sleep time

### BODY POSITION:

78% of the night spent in the supine position  
22% of the night spent in the non-supine position

### LIMB MOVEMENTS:

Periodic Limb Movement Index is 30.9 events/hour.  
Of the arousals noted above 3.7 events/hour were associated with arousals.

Arousal index: 16.8 events/hour.  
Most of the arousals are spontaneous in origin.

### RESPIRATORY:

Using silent sleep device #1 (second device used) the patient slept 246.9 minutes including time in Stage REM sleep as well as in the supine position.  
Total obstructive apneas: 0.  
Total hypopneas: 13.

Apnea Hypopnea Index (AHI): 3.2 events/hour.

### OXYGENATION:

Using the silent sleep device.  
Mean SpO<sub>2</sub>: 93.9%.  
SpO<sub>2</sub> nadir: 89%.  
Time spent with saturations less than 90%: 0% of total sleep time.

EKG: Normal sinus rhythm.

EEG NOTES: Bruxism was noted.

## MANDIBULAR ADVANCEMENT DEVICE TITRATION

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### CONCLUSIONS:

- 1) The patient's obstructive sleep apnea was eliminated using the second silent sleep device (labeled #1).
- 2) The patient had no significant nocturnal hypoxemia
- 3) The patient had mild to moderate periodic limb movement disorder.
- 4) The patient had relatively normal sleep architecture.

### RECOMMENDATIONS:

- 1) Continue with the silent sleep device labeled #1 in an attempt to correct the patient's underlying obstructive sleep apnea.
- 2) Consider treatment of his periodic limb movement disorder if sleep maintenance insomnia or daytime hypersomnolence persists.
- 3) The patient should avoid driving or operating heavy machinery while sleepy.
- 4) The patient will follow up as scheduled with Jamison Spencer, DMD.
- 5) Please feel free to call with any questions.

MARK RASMUS, M.D./dv

cc: Jamison Spencer, DMD  
David Nielsen, MD