

# ***VALLEY SLEEP CENTER***

1612 West Olive Avenue, Suite #301  
Burbank, CA. 91506  
(818) 563-5412

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Patient Name: John Doe  
Age / Sex: 34/Male  
Date of Procedure: December 18, 2009  
Requesting Physician: Dr. J. Smith  
Indications: Rule out Sleep Apnea  
Requested study: Polysomnogram with CPAP/Bilevel if indicated

## **SPLIT NIGHT POLYSOMNOGRAM REPORT**

### **INDICATIONS:**

Mr. Doe weighs 247lbs. and is 5'2" tall with a Body Mass Index of 45.2. The patient does not smoke cigarettes and takes the following medication: Ibuprofen, Nifedipine and Lisinopril. The patient presents to the sleep lab with complaints of neck pain affecting his sleep and waking up choking and gasping for air, waking up with a dry mouth and headaches. The patient has an Epworth Sleepiness scale of 9/24 and reports a history of chest pain and high blood pressure.

### **TECHNIQUE:**

After the scalp was prepared, electrodes were applied according to the International 10-20 System of Electrode Placement. EEG was monitored from C3, C4, O1 and O2. Electrodes placed at the outer canthi monitored eye movements continuously. Nasal and oral airflow were monitored using a double port thermocouple. The respiratory effort was monitored by piezo-electric technology using abdominal and thoracic belts. Blood oxygen saturation was monitored by pulse oximetry. Heart rate and rhythm were monitored by surface electrocardiogram. Anterior tibialis EMG was studied using surface electrodes placed on both legs. Another EMG electrode was placed on the chin. A snoring sensor was used to monitor tracheal vibration and snoring.

### **TECHNICAL DISCUSSION- Baseline Portion:**

Mr. Doe underwent a nocturnal sleep study under continuous observation by a sleep technologist on the night of Demember 18, 2009. Sleep onset was 3.0 minutes and the sleep efficiency was 87%. REM latency was 135.5 minutes. A total of 213 obstructive events (157 apneas/56 hypopneas) were noted with an overall Respiratory Disturbance Index (RDI) of 96.5 per hour. Respiratory disturbances occurred more frequently during REM sleep with an RDI of 97.8 events per hour. The patient's SaO2 baseline was 96% and the lowest SaO2 was 66%. The patient's snoring was moderate to severe and there was no snore arousals noted. No EKG abnormalities were noted. There was no periodic leg movements (PLM) noted on the anterior tibialis EMG.

**Patient:** Doe, John  
**Study Date:** December 18, 2009

**ID:** 09-1234  
**Technologist:** T.J. Hooker, PSGT  
**Scored by:** Rich Harvest, RPSGT

**TECHNICAL DISCUSSION- CPAP Portion:**

CPAP was initiated at a rate of 4.0 cm/H<sub>2</sub>O and titrated up to a maximum pressure of 12 cm/H<sub>2</sub>O using a Respiroics Comfort Gel mask, size medium with humidification. The patient's tolerance for the study was good. There was no periodic leg movements (PLM) noted on the anterior tibialis EMG.

All significant disordered breathing events and snoring were eliminated and the patient's SaO<sub>2</sub> levels were normalized with CPAP 12 cm/H<sub>2</sub>O. The patient reported waking up feeling well-rested, sleeping better than usual and that CPAP therapy was great.

**DISCUSSION:**

There are severe obstructive respiratory events associated with oxygen desaturation which improve with successful nasal CPAP titration. Therapeutic alternatives include use of CPAP, surgery, or oral appliances. If surgery or an oral appliance is prescribed, a repeat study to determine effectiveness is suggested.

Sleep apnea is a risk factor for cardiovascular disease. This risk may be reduced if the apnea is effectively treated. In addition to therapy of apnea, the patient should follow good sleep hygiene habits, minimize sedatives and hypnotics, maintain ideal body weight, and avoid activities requiring alertness until treated.

**IMPRESSION:**

1. Severe Obstructive Sleep Apnea
2. Successful CPAP Titration

**RECOMMENDATIONS:**

1. Nasal CPAP @ 12 cm H<sub>2</sub>O Comfort Gel (M) mask and humidification
2. Follow Good Sleep Hygiene Habits
3. Achieve and Maintain Ideal Body Weight
4. Minimize Sedatives and Hypnotics
5. Avoid Activities Requiring Alertness Until Treatment is Started



Earl E. Sleepman, M.D. FAASM  
Diplomate, American Board of Sleep Medicine

**Patient:** X  
**Study Date:** 9/24/2009  
**Report created:** 10/1/2009

**ID:** XX  
**Technician:** T.J. Henry, PSGT  
**Scored by:** Richard Harter, RPSGT

### DIAGNOSTIC SECTION

#### Sleep Staging Data

Recording Start	9:39 PM	Total Sleep Time	132.5 min. (2.2 hrs.)
Lights Out	10:00 PM	Wake Before Sleep	3.0 min.
Sleep Onset	10:03 PM	Wake During Sleep	17.5 min.
Lights On	12:33 AM	Wake After Sleep	0.0 min.
Recording End	5:01 AM	Total Wake Time	20.5 min.
Recording Time	442.4 min. (7.4 hrs.)	REM Time	13.5 min.
Time In Bed	153.0 min. (2.6 hrs.)	NREM Time	119.0 min.
		Slow Wave Sleep Time	8.5 min.
		Movement Time	0.0 min.
Sleep Onset	3.0 min.	Epochs In Bed	306
REM Latency	135.5 min. (2.3 hrs.)	Epochs of Total Sleep Time	265
Latency to Stage 1	3.0 min. (from Lights Out)		
Latency to REM	138.5 min. (2.3 hrs.) (from Lights Out)		

Sleep Efficiency 87%

Total Stage Changes 99  
 Stage Changes per Hour of Sleep 44.8

	Time (min.)	% TST	% TIB
Stage 1	61.0	46	40
Stage 2	49.5	37	32
Stage 3	8.5	6	6
Stage 4	0.0	0	0
REM	13.5	10	9
Awake	20.5	---	13
Movement Time	0.0	---	0

#### Arousal Statistics

	REM	NREM	Total
With Respiratory Events	0	0	0
With PLMS Events	0	0	0
With Snoring Events	0	0	0
Non-Specific Arousals	0	0	0
Total Occurrences	0	0	0
Index	0.0	0.0	0.0

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### Respiratory Report

**RDI TST:** 96.5  
RDI NREM: 96.3  
RDI REM: 97.8

<b>NREM</b>	<b> -- Central</b>	<b>Apnea Obstructive</b>	<b>--  Mixed</b>	<b>Hypopnea</b>
Occurrences	0	139	0	52
Max. Duration (sec.)	---	50.8	---	31.0
Mean Duration (sec.)	---	17.3	---	15.5
Total Duration	0.0 min.	40.1 min.	0.0 min.	13.5 min.
Index	0.0	70.1	0.0	26.2

<b>REM</b>	<b> -- Central</b>	<b>Apnea Obstructive</b>	<b>--  Mixed</b>	<b>Hypopnea</b>
Occurrences	0	18	0	4
Max. Duration (sec.)	---	35.8	---	17.6
Mean Duration (sec.)	---	18.8	---	14.0
Total Duration	0.0 min.	5.6 min.	0.0 min.	0.9 min.
Index	0.0	80.0	0.0	17.8

<b>Total Sleep Time</b>	<b> -- Central</b>	<b>Apnea Obstructive</b>	<b>--  Mixed</b>	<b>Hypopnea</b>
Occurrences	0	157	0	56
Max. Duration (sec.)	---	50.8	---	31.0
Mean Duration (sec.)	---	17.5	---	15.4
Total Duration	0.0 min.	45.7 min.	0.0 min.	14.4 min.
Index	0.0	71.1	0.0	25.4

Lowest SaO2 w/a Respiratory Event: 66%, REM  
Lowest Heart Rate w/a Respiratory Event: 37 bpm  
Respiratory Event with Arousal Index: 0.0

### Body Position Report

<b>Position</b>	<b>Time (min.)</b>	<b>REM (min.)</b>	<b>NREM (min.)</b>	<b>Apnea C / O / M</b>	<b>Hypopnea</b>	<b>RDI</b>
Supine	143.61	13.50	114.50	0 / 151 / 0	51	94.7
Left	5.04	0.00	3.50	0 / 3 / 0	5	137.1
Prone	0.00	0.00	0.00	0 / 0 / 0	0	---
Right	4.35	0.00	1.00	0 / 3 / 0	0	180.0
Upright	0.00	0.00	0.00	0 / 0 / 0	0	---
Non-supine	9.39	0.00	4.50	0 / 6 / 0	5	146.7

### Snoring Statistics

	<b>REM</b>	<b>NREM</b>	<b>Total</b>
With Arousal	0	0	0
Arousal Index	0.0	0.0	0.0
Total Occurrences	45	547	592
Index	200.0	275.8	268.1
Time (min.)	1.06	12.36	13.42

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### Cardiac Report

Mean Heart Rate 71.3 bpm  
Standard Deviation 7.6  
Lowest heart rate w/respiratory event 37 bpm

### Oximetry Report

Lowest SaO2 during sleep 66%, REM  
Lowest SaO2 with a respiratory event 66%, REM  
Lowest SaO2 during Wake 71%

### Oximetry Summary

	<b>Total</b>	<b>REM</b>	<b>NREM</b>	<b>Awake</b>
50%	0.0 min.	0.0 min.	0.0 min.	0.0 min.
51 - 60%	0.0 min.	0.0 min.	0.0 min.	0.0 min.
61 - 70%	0.9 min.	0.9 min.	0.0 min.	0.0 min.
71 - 80%	5.9 min.	4.5 min.	0.9 min.	0.5 min.
81 - 90%	32.9 min.	4.5 min.	24.8 min.	3.6 min.
91 - 100%	113.3 min.	3.7 min.	93.3 min.	16.4 min.
Average	91.86	83.27	92.64	93.02
Average Event Minimum	86.89	73.98	88.36	88.50
Desaturation Index	88.8	88.9	88.7	
# Desat. below 98%	30	2	28	

### Time In Bed Summary

<b>SaO2 (%)</b>	<b>% Time In Bed</b>	<b>(min.)</b>
>90	74.06	113.3
86 - 90	16.00	24.5
81 - 85	5.48	8.4
76 - 80	1.99	3.0
71 - 75	1.86	2.9
66 - 70	0.56	0.9
61 - 65	0.00	0.0
56 - 60	0.00	0.0
51 - 55	0.00	0.0
50	0.00	0.0

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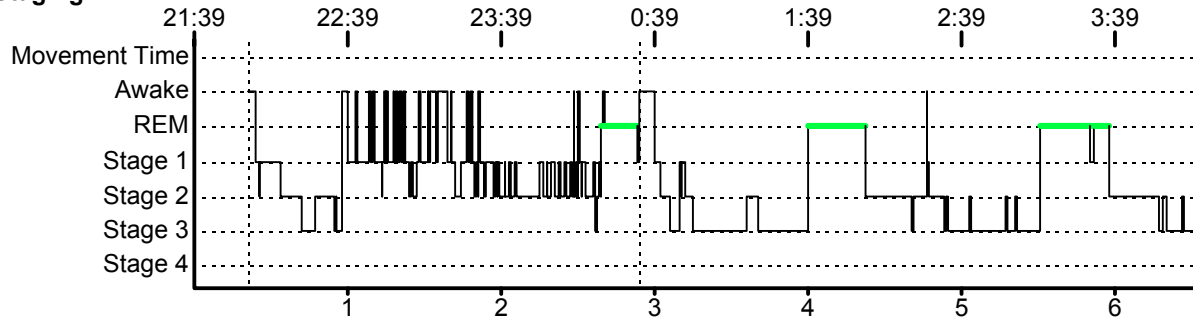
**Periodic Limb Movement Report**

	<b>In Episodes</b>	<b>Not In Episodes</b>	<b>Total</b>
Total Number of Limb Movements (TST)	---	0	0
Limb Movement Index	---		0.0
Limb Movements with Arousal Index	---	0.0	0.0
Limb Movements During NREM	---	0	0
Limb Movements During REM	---	0	0
Limb Movements During Wake	---	0	0
Limb Movements w/Respiratory Events (NREM)	---	0	0
Limb Movements w/Respiratory Events (REM)	---	0	0
Limb Movements w/Arousal During NREM	---	0	0
Limb Movements w/Arousal During REM	---	0	0
Number of Episodes	0		
Mean Duration of Episodes	---		
Total Duration of Episodes	---		

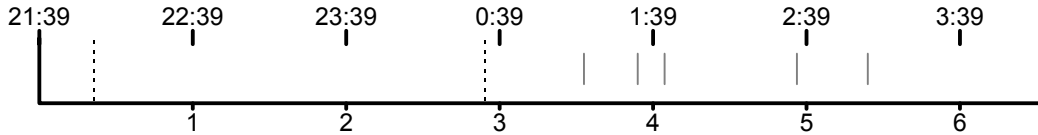
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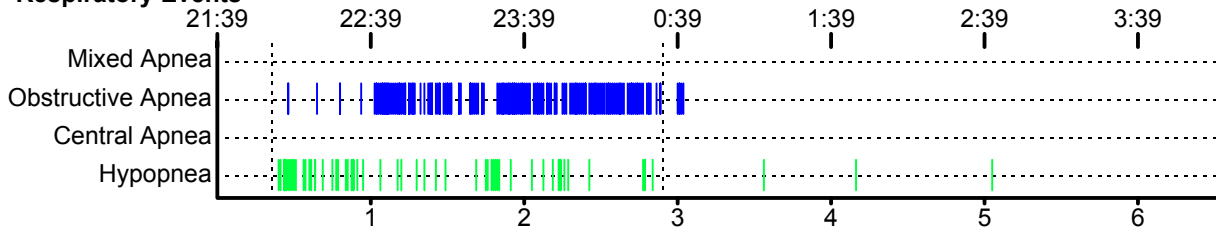
**Staging**



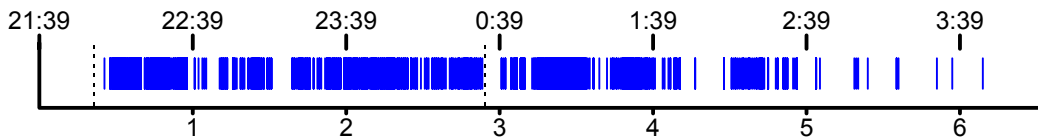
**Arousal**



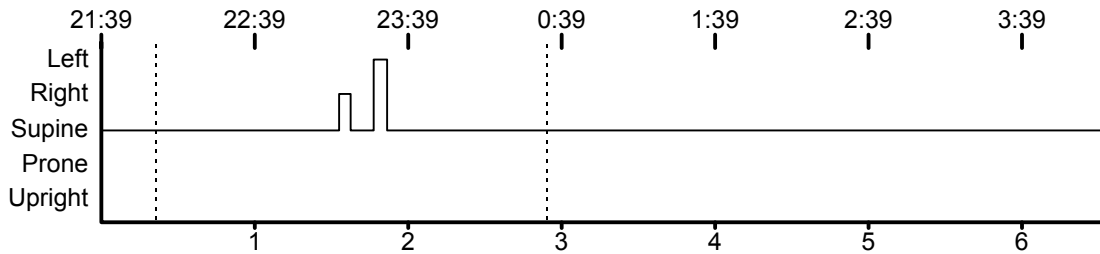
**Respiratory Events**



**Snore**



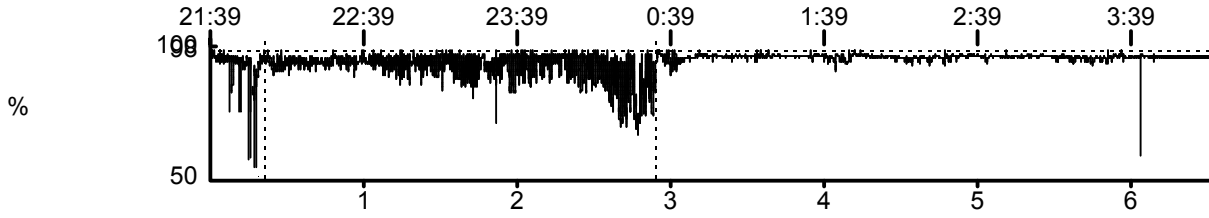
**Position**



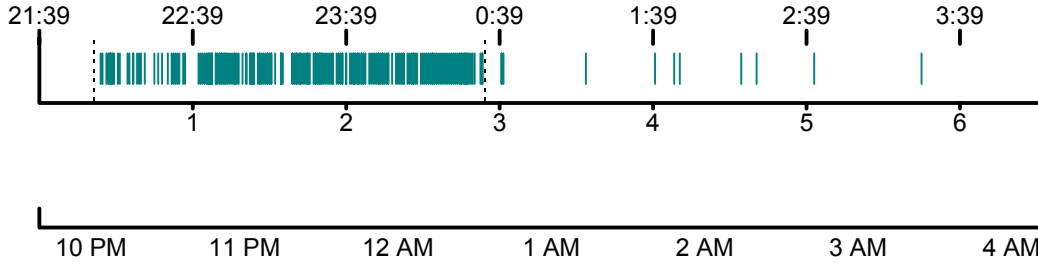
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**SaO2**



**O2 Desaturation**



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## TREATMENT SECTION

### Sleep Staging Data

Recording Start	9:39 PM	Total Sleep Time	210.5 min. (3.5 hrs.)
Lights Out	12:34 AM	Wake Before Sleep	5.5 min.
Sleep Onset	12:39 AM	Wake During Sleep	0.5 min.
Lights On	4:10 AM	Wake After Sleep	0.0 min.
Recording End	5:01 AM	Total Wake Time	6.0 min.
Recording Time	442.4 min. (7.4 hrs.)	REM Time	47.0 min.
Time In Bed	216.5 min. (3.6 hrs.)	NREM Time	163.5 min. (2.7 hrs.)
		Slow Wave Sleep Time	93.0 min.
		Movement Time	0.0 min.
Sleep Onset	5.5 min.	Epochs In Bed	433
REM Latency	60.0 min.	Epochs of Total Sleep Time	421
Latency to Stage 1	5.5 min. (from Lights Out)		
Latency to REM	65.5 min. (from Lights Out)		
Sleep Efficiency	97%		
Total Stage Changes	35		
Stage Changes per Hour of Sleep	10.0		

	<u>Time (min.)</u>	<u>% TST</u>	<u>% TIB</u>
Stage 1	6.0	3	3
Stage 2	64.5	31	30
Stage 3	93.0	44	43
Stage 4	0.0	0	0
REM	47.0	22	22
Awake	6.0	---	3
Movement Time	0.0	---	0

### Arousal Statistics

	<u>REM</u>	<u>NREM</u>	<u>Total</u>
With Respiratory Events	0	0	0
With PLMS Events	0	0	0
With Snoring Events	1	4	5
Non-Specific Arousals	0	0	0
Total Occurrences	1	4	5
Index	1.3	1.5	1.4

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**Respiratory Report**

**RDI TST:** 2.3  
**RDI NREM:** 2.6  
**RDI REM:** 1.3

<b>NREM</b>	<b> -- Central</b>	<b>Apnea Obstructive</b>	<b>--  Mixed</b>	<b>Hypopnea</b>
Occurrences	0	5	0	2
Max. Duration (sec.)	---	19.2	---	30.3
Mean Duration (sec.)	---	16.2	---	25.8
Total Duration	0.0 min.	1.3 min.	0.0 min.	0.9 min.
Index	0.0	1.8	0.0	0.7

<b>REM</b>	<b> -- Central</b>	<b>Apnea Obstructive</b>	<b>--  Mixed</b>	<b>Hypopnea</b>
Occurrences	0	0	0	1
Max. Duration (sec.)	---	---	---	26.3
Mean Duration (sec.)	---	---	---	26.3
Total Duration	0.0 min.	0.0 min.	0.0 min.	0.4 min.
Index	0.0	0.0	0.0	1.3

<b>Total Sleep Time</b>	<b> -- Central</b>	<b>Apnea Obstructive</b>	<b>--  Mixed</b>	<b>Hypopnea</b>
Occurrences	0	5	0	3
Max. Duration (sec.)	---	19.2	---	30.3
Mean Duration (sec.)	---	16.2	---	25.9
Total Duration	0.0 min.	1.3 min.	0.0 min.	1.3 min.
Index	0.0	1.4	0.0	0.9

Lowest SaO2 w/a Respiratory Event: 90%, Stage 1  
 Lowest Heart Rate w/a Respiratory Event: 61 bpm  
 Respiratory Event with Arousal Index: 0.0

**Body Position Report**

<b>Position</b>	<b>Time (min.)</b>	<b>REM (min.)</b>	<b>NREM (min.)</b>	<b>Apnea C / O / M</b>	<b>Hypopnea</b>	<b>RDI</b>
Supine	216.50	47.00	163.50	0 / 5 / 0	3	2.3
Left	0.00	0.00	0.00	0 / 0 / 0	0	---
Prone	0.00	0.00	0.00	0 / 0 / 0	0	---
Right	0.00	0.00	0.00	0 / 0 / 0	0	---
Upright	0.00	0.00	0.00	0 / 0 / 0	0	---
Non-supine	0.00	0.00	0.00	0 / 0 / 0	0	---

**Snoring Statistics**

	<b>REM</b>	<b>NREM</b>	<b>Total</b>
With Arousal	1	4	5
Arousal Index	1.3	1.5	1.4
Total Occurrences	28	382	410
Index	35.7	140.2	116.9
Time (min.)	0.70	8.09	8.79

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**Scored by:**

**Therapy Report**

Therapy (cm H2O)	Total Time (min.)	REM (min.)	NREM (min.)	Apnea C / O / M	Hypopnea	Snore Index	RDI	Arousal Index
4	3.65	0.00	0.00	0 / 0 / 0	0	---	---	---
5	4.03	0.00	2.34	0 / 5 / 0	0	128.6	128.6	0.0
6	22.41	0.00	22.41	0 / 0 / 0	0	353.6	0.0	0.0
8	19.81	0.00	19.81	0 / 0 / 0	1	251.5	3.0	3.0
9	26.92	11.47	15.45	0 / 0 / 0	1	234.2	2.2	4.5
11	81.39	12.89	68.00	0 / 0 / 0	1	58.6	0.7	1.5
12	58.14	22.64	35.50	0 / 0 / 0	0	6.2	0.0	0.0

**Cardiac Report**

Mean Heart Rate 65.8 bpm  
 Standard Deviation 4.1  
 Lowest heart rate w/respiratory event 61 bpm

**Oximetry Report**

Lowest SaO2 during sleep 90%, Stage 1  
 Lowest SaO2 with a respiratory event 90%, Stage 1  
 Lowest SaO2 during Wake 89%

**Oximetry Summary**

	Total	REM	NREM	Awake
50%	0.0 min.	0.0 min.	0.0 min.	0.0 min.
51 - 60%	0.0 min.	0.0 min.	0.0 min.	0.0 min.
61 - 70%	0.0 min.	0.0 min.	0.0 min.	0.0 min.
71 - 80%	0.0 min.	0.0 min.	0.0 min.	0.0 min.
81 - 90%	0.4 min.	0.1 min.	0.1 min.	0.2 min.
91 - 100%	216.0 min.	46.9 min.	163.3 min.	5.8 min.
Average	95.63	95.42	95.69	95.71
Average Event Minimum	91.89	93.20	91.43	---
Desaturation Index	3.1	5.1	2.6	
# Desat. below 98%	18	6	12	

**Time In Bed Summary**

SaO2 (%)	% Time In Bed	(min.)
>90	99.78	216.0
86 - 90	0.18	0.4
81 - 85	0.00	0.0
76 - 80	0.00	0.0
71 - 75	0.00	0.0
66 - 70	0.00	0.0
61 - 65	0.00	0.0
56 - 60	0.00	0.0
51 - 55	0.00	0.0
50	0.00	0.0

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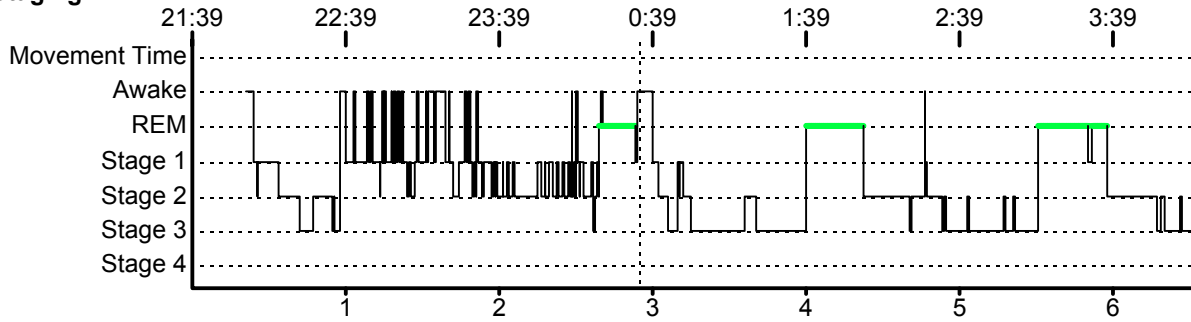
**Periodic Limb Movement Report**

	<b>In Episodes</b>	<b>Not In Episodes</b>	<b>Total</b>
Total Number of Limb Movements (TST)	---	0	0
Limb Movement Index	---		0.0
Limb Movements with Arousal Index	---	0.0	0.0
Limb Movements During NREM	---	0	0
Limb Movements During REM	---	0	0
Limb Movements During Wake	---	0	0
Limb Movements w/Respiratory Events (NREM)	---	0	0
Limb Movements w/Respiratory Events (REM)	---	0	0
Limb Movements w/Arousal During NREM	---	0	0
Limb Movements w/Arousal During REM	---	0	0
Number of Episodes	0		
Mean Duration of Episodes	---		
Total Duration of Episodes	---		

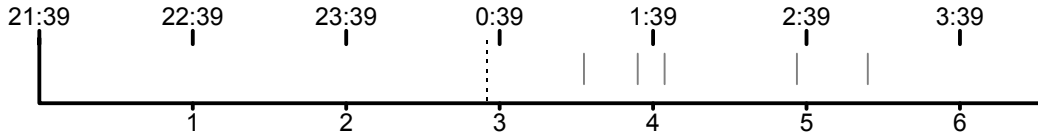
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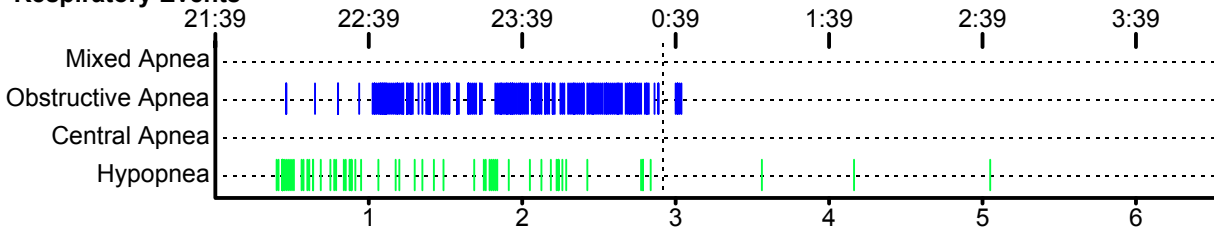
**Staging**



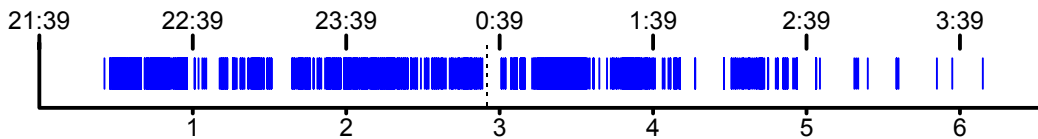
**Arousal**



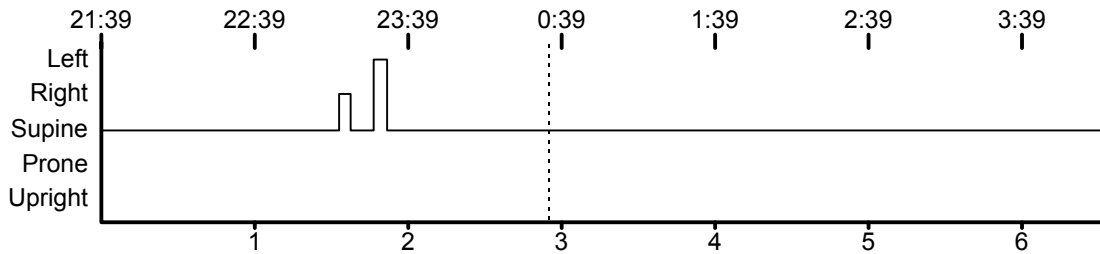
**Respiratory Events**



**Snore**



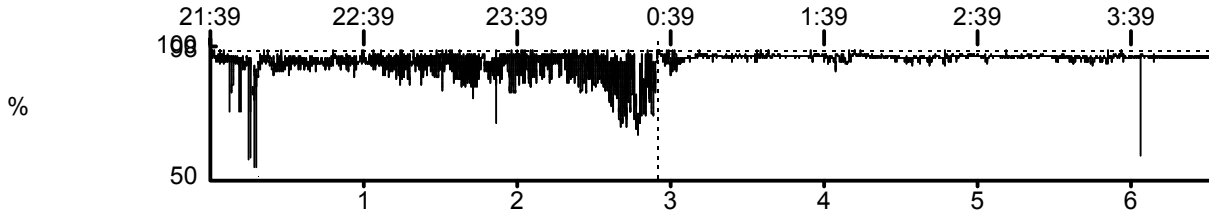
**Position**



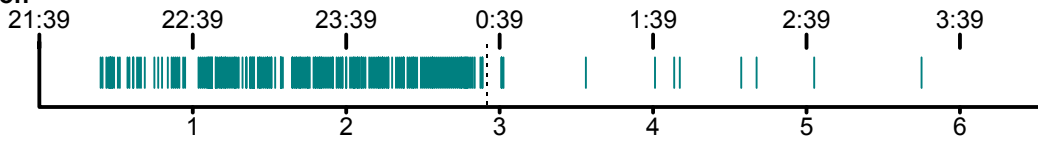
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**SaO2**



**O2 Desaturation**



**CPAP & Bilevel**

