Sleep Reports: How and What To Tell Your Patients

Clinical Sleep Educator Course

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Sleep Reports: How and What to Tell Your Patients: Objectives

Sleep Study (PSG): Why do a sleep study

- What is involved
- Results of the sleep study
- Why treat
- Treatment options
- Weight Loss and Life Style

- CPAP
- Oromandibular Devices
- Upper Airway Stimulation
- Nasal EPAP/Oral Pressure Therapy
Why Do a Sleep Study

- Diagnosis of suspected sleep apnea (70-80%)
- CPAP titration in patients with complex OSA
- Assessment of treatment in select cases (surgery, wt loss, Oromandibular device)
- Prior to MSLT in suspected narcolepsy
- May be considered in patients with neuromuscular disorders and sleep related symptoms
Why Do a Sleep Study

• Abnormal movement activity in sleep
  Suspected Periodic Limb movement disorder
  Suspected nocturnal seizures
• Parasomnias- REM Behavior Disorder
  Sleep related violent behaviors
• Unexplained chronic insomnia> 3months
  May be related to OSA especially in women
Types of Sleep Studies

- **Standard Polysomnography (PSG)**  Most common
  Attended overnight recording or
  Patients normal sleep time (Shift worker)
- **Portable Home Sleep Studies: Select patients**
- **Multiple Sleep Latency Test (MSLT)**  Uncommon
  5 daytime naps, 20 minutes each
  Objective measure of daytime sleepiness
- **Maintenance of Wakefulness Test (MWT)**  Rare
  Similar to MSLT, but patient stays awake
  Documents ability to stay awake (FAA, DOT)
Portable Home Sleep Testing

Appropriate use

• Select patients with high pre-test probability for OSA and no significant comorbidity

• Patients with negative HST need to undergo attended in-lab PSG

• Patients with positive home sleep study can undergo Auto PAP or PSG for optimum CPAP titration

• HST does not replace but complement an attended in-lab sleep study lab
What is Involved: Parameters Recorded during Standard PSG

- **Sleep Stage parameters**
  - EEG, EOG, Chin EMG
- **Leg EMG** - Ant. Tibialis
- **Body position**
- **Airflow Parameters:**
  - Nasal/oral *thermistor* for apneas
  - Pressure sensor for hypopneas
  - End-tidal CO2-children

- **Effort Parameters:**
  - Thoracic, Abdominal
- **Oxygen saturation-Pulse oximetry**
- **ECG:** single modified lead II
- **Snoring microphone**
- **Video recording-synchronized**
- **CPAP/BPAP use**
Patient: Can we Record the Dreams?

My Answer: Wish we Could!
What is Involved in Polysomnography?

- Apnea
- Arousal
- Desaturation
- Pressure Sensor
- Thermistor
- Effort: Abd & Thoracic
- EOGs
- EEG-Occp & Parietal
- EMG Chin
- EKG
- Leg
Portable Home Sleep Study
PSG: Summary Statements
AASM Guidelines

• Findings related to sleep diagnosis- severity, oxygen desaturation levels
• EEG abnormalities: alpha intrusion, spikes
• ECG abnormalities
• Behavioral observations: movements/seizure
• Sleep hypnogram
• CPAP titration: Full night / Split night
• Interval CPAP treatment report
• Type of interface, chin strap, humidifier, oxygen use
Sleep Study Report Elements to be Discussed with the Patient

Goal: Educate and Empower Patients Using Chronic Disease Model for OSA

- Show them their color sleep hypnogram
- Why Treat
- Treatment options
- Potential benefits
- Potential adverse effects of untreated sleep apnea
- Strategies to overcome potential barriers and improve adherence to CPAP
Results: Split-Night Study
KM-Split Night CPAP Titration Interval Report
Why Treat

• Excessive daytime Sleepiness or fatigue
• Improve Quality of Sleep: Patient and bed partner
• Improve daytime function
  Level of alertness
  Cognitive function
• Reduce/eliminate the respiratory events, snoring, arousals and improve oxygen saturation
Potential Benefits of Treatment

- Improve EDS
- Improve neuro-cognitive impairment
- Reduce cardiovascular and metabolic consequences
- Reduce mortality
- Relieve snoring
Severity of Sleep Apnea

Based on AHI or RDI
- < 5 Normal
- 5-15 / hr—Mild
- 15-30 / hr—Moderate
- > 30/ hr—Severe

Severity can also be based on
- Degree of sleep disruption
- Extent of oxygen desaturation
- Presence of arrythmias
- Duration of respiratory events
Treatment Decisions for Sleep Apnea

Based on

• Severity of Sleep Apnea

• Degree of Daytime Sleepiness

• Presence of co-morbidity
Treatment Options: Behavioral Management of OSA

- Weight loss
- Life style changes: Exercise and healthy eating (not just diet)
- Avoid alcohol and sedative
- Positional therapy: Avoid supine position (tennis ball) 30-60 degree head elevation
Weight Loss Made Simple
50/100 Rule

Follow the 50/100 Rule

Eat 50% less of usual food intake

Exercise 100% more than usual activity
Mean Change in AHI index by Weight Change Category

Peppard PE. JAMA 2000;284: 3015
Surgical vs Conventional Therapy for Weight Loss In OSA: A Randomized Control Trial

RCT 60 subjects: Lap gastric banding (30) vs conventional weight loss (30)

Primary Outcome: Change in mean AHI (baseline to 2 years)

Secondary Outcomes: Weight change, CPAP adherence & functional status

Results: greater surgical weight loss vs C Significant difference in AHI at 2 years from baseline in both groups.

Difference in AHI between 2 groups: -11.5/h (CI -28.3 to 5.3/h P= 0.18)

Dixon JB et al. JAMA 2012; 308: 1142-1149
Effect of Exercise Training on OSA and Sleep Quality: RCT

Kline CE et al. SLEEP 2011; 34:1631-1640

• 12 week exercise program (E) n=27 (mod intensity AE 40 min x 4/week +RT x 2/week compared to control n=16 (stretching exercise x2/week)

• Modest treatment efficacy with “E” with reduction in AHI and ODI and improvement in sleep quality without significant decrease in body weight
First Line Treatment Option
How Does CPAP Work? Pneumatic Splint

A. Normal
B. Airway blocked
C. Positive pressure Airway open
Treatment Options

CPAP

• First-Line Treatment option for:
  Mild, Moderate and Severe OSA

• Autotitrate vs Fixed CPAP

• Variety of different masks

• Expect some time to acclimatize

• Costs- Rent to Own

  Future mask and tubing requirements
Adjustable Mandibular Advancing Device

- Advances the mandible and tongue forward to enlarge airway space
- Mild-moderate OSA
- Custom fitted by knowledgeable dentist
- Follow up PSG critical to document efficacy
Treatment Options: Surgery

- Surgery: reserved for select patients
- Nasal septum corrective surgery
  - Reduce the severity of apneas
  - Improve compliance with CPAP
- Tonsillectomy for enlarged tonsils
- Advise against UPPP
- Tracheostomy for select patients
Treatment Options: Medicines

• Treat nasal congestion/allergies (Common)
  Nasal steroids
  Non-sedating antihistamines
• Reduces snoring/respiratory events
• Improves compliance with CPAP
• Nonbenzodiazapine receptor agonist in select patients to promote CPAP compliance
Other Treatment Options

• Upper Airway Stimulation
• Expiratory Positive Airway Pressure device
• Oral Negative Pressure Therapy
Upper Airway Stimulation For OSA

- Prospective multicenter, single group study
- CPAP intolerant 126 moderate to severe OSA AHI>15
- Excluded: BMI >32
- Concentric airway narrowing on endoscopy
- Primary outcome: 12 months AHI; ODI
- Secondary outcome: ESS, FOSQ

Strollo. NEJM 2014;370: 139-149
## Primary and Secondary Outcomes at 12 Months

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Baseline</th>
<th>12 Months</th>
<th>Change</th>
<th>P Value</th>
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<tbody>
<tr>
<td><strong>Primary outcomes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHI score†</td>
<td>32.0±11.8</td>
<td>15.3±16.1</td>
<td>-16.4±16.7</td>
<td>&lt;0.001</td>
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<tr>
<td>Median</td>
<td>29.3</td>
<td>9.0</td>
<td>-17.3</td>
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<tr>
<td>Interquartile range</td>
<td>23.7 to 38.6</td>
<td>4.2 to 22.5</td>
<td>-26.4 to -9.3</td>
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<tr>
<td>ODI score‡</td>
<td>28.9±12.0</td>
<td>13.9±15.7</td>
<td>-14.6±15.8</td>
<td>&lt;0.001</td>
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<tr>
<td>Median</td>
<td>25.4</td>
<td>7.4</td>
<td>-15.7</td>
<td></td>
</tr>
<tr>
<td>Interquartile range</td>
<td>19.5 to 36.6</td>
<td>3.5 to 20.5</td>
<td>-24.0 to -8.6</td>
<td></td>
</tr>
<tr>
<td><strong>Secondary outcomes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOSQ score§</td>
<td>14.3±3.2</td>
<td>17.3±2.9</td>
<td>2.9±3.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Median</td>
<td>14.6</td>
<td>18.2</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Interquartile range</td>
<td>12.1 to 17.1</td>
<td>16.2 to 19.5</td>
<td>0.7 to 4.7</td>
<td></td>
</tr>
<tr>
<td>Epworth Sleepiness Scale score¶</td>
<td>11.6±5.0</td>
<td>7.0±4.2</td>
<td>-4.6±5.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Median</td>
<td>11.0</td>
<td>6.0</td>
<td>-4.0</td>
<td></td>
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<tr>
<td>Interquartile range</td>
<td>8.0 to 15.0</td>
<td>4.0 to 10.0</td>
<td>-8.0 to -1.0</td>
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<tr>
<td>Percentage of sleep time with oxygen saturation &lt;90%</td>
<td>8.7±10.2</td>
<td>5.9±12.4</td>
<td>-2.5±11.1</td>
<td>0.01</td>
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<tr>
<td>Median</td>
<td>5.4</td>
<td>0.9</td>
<td>-2.2</td>
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<tr>
<td>Interquartile range</td>
<td>2.1 to 10.9</td>
<td>0.2 to 5.2</td>
<td>-6.6 to -0.3</td>
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</tbody>
</table>

*Plus–minus values are means ±SD. Two participants did not complete follow-up at 12 months: one participant died unexpectedly 10 months after implantation owing to a cardiac event that was not thought to be related to the implant, and one requested explantation of the device because of personal choice. In the primary-outcome analysis, both participants were considered not to have had a response to therapy. Means, standard deviations, medians, and interquartile ranges are presented because some variables (e.g., the 12-month scores on the apnea–hypopnea index [AHI] and oxygen desaturation index [ODI]) show evidence of nonnormality.*

†The AHI score indicates the number of apnea or hypopnea events per hour; a score of 15 or more events per hour indicates moderate-to-severe obstructive sleep apnea.

‡The ODI score indicates the number of times per hour of sleep that the blood oxygen level drops by 4 percentage points or more from baseline.

§Scores on the Functional Outcomes of Sleep Questionnaire (FOSQ) range from 5.0 to 20.0, with higher scores indicating better functioning. A score of more than 17.9 is considered to be the threshold for persons with normal sleep-related quality of life. A change of 2.0 or more points in the score is considered to indicate a clinically meaningful improvement of daily functioning.*

¶Scores on the Epworth Sleepiness Scale range from 0.0 to 24.0, with lower scores indicating less daytime sleepiness. Data at 12 months were missing for one participant in addition to the two who did not complete the 12-month follow-up.
Randomized Therapy Withdrawal Trial at 12 Months

Primary Outcomes at 12 Months

Randomized therapy withdrawal in 46 consecutive subjects who had good response to therapy

Strollo. NEJM 2014;370: 139-149
Novel Expiratory Positive Airway Pressure (EPAP) Device

- Novel micro valve technology
- Allows one way inspiratory airflow
- Valve shut off during expiration but airflows thru small openings
- EPAP build up
Oral Negative Pressure Therapy for OSA: Clinical Feasibility

Single Center study: 76 subjects (20 women)

**OPT:** gentle negative pressure pulls soft palate anteriorly
Prefabricated mouth pieces
10 sizes

Baseline mean values:
BMI 32.5
AHI 38.7 +/- 27.5
ODI 30.1 +/- 23.7

**Post OPT single night study**
AHI 24.6 +/- 25.7 (p<0.001)
AHI < 10 38% subjects
ODI 15.8 +/- 19.1

Oral Pressure Therapy for OSA: Multicenter Trial

Prospective, open label, RC, first-night order control vs Tx 5 Center, 4 weeks trial

63 subjects (screened 367)
Men 69.8%
Age: 53.6 +/- 8.9 yrs
BMI: 32.3 +/- 4.5
Mild to severe AHI

Average nightly use: 6 +/- 1.4h
AHI median: 27.5 vs 13.4; 14.8
Improved sleep continuity and quality (stage shifts)
ESS: 12.1 vs 8.6

OPT safe and well tolerated with high nightly use
Periodic Limb Movements in Sleep: Do we need to Treat?

• PLMS are **commonly** seen in patients with RLS but RLS is a distinct clinical syndrome

• PLMS noted on sleep studies in OSA patients **typically resolve** with CPAP treatment

• Consider treatment only if patient is symptomatic after CPAP treatment for OSA (Rare)
CMS/Insurance Guideline for CPAP Coverage

• Face to face visit: beyond 4 weeks but within 12 weeks

• **Document Clinical improvement:**
  Night time sleep and daytime function
  Improvement in ESS

• **CPAP Adherence: Objective CPAP use download**
  Minimum use 4 hrs/night 70% time (21 days in 30 consecutive days)
Global Clinical Improvement with CPAP

- Overall clinical improvement with CPAP on a scale of 1-10 as compared to no CPAP
  - 9-10 significant improvement
  - 7-8 noticeable improvement (CPAP use and sleep time)
  - 5-6 modest improvement (CPAP use, sleep time and mask issues)
  - 3-4 minimal benefit (CPAP use, mask issues)
  - 1-2 very little benefit (claustrophobia, mask issues)
Case Studies
Case Example 1

- MH – 50 year old male with classical symptoms of snoring, apneas and daytime sleepiness (ESS 18)
- History of hypertension, Atrial Fib, Diabetes
- BMI 45; Neck size 17.5 inches
- PSG: AHI 50 and RDI 60
- **Impression:** OSA with multiple comorbidities
Case 1 Question

What is the best treatment option for this case?

A. Weight loss
B. Oromandibular device
C. Surgery
D. Nasal CPAP
Case 1 Answer

What is the best treatment option for this case?

A. Weight loss
B. Oromandibular device
C. Surgery
D. Nasal CPAP
Case Example 2

- NE- 40 year old male with history of loud snoring, no witnessed apneas, non-restful sleep and daytime fatigue/sleepiness (ESS 12)
- No co-morbidity
- BMI 26  Neck size 15.5 inches  mild retrognathia
- PSG: AHI 7  RDI 14
- Impression:
Case Example 2

• NE- 40 year old male with history of loud snoring, no witnessed apneas, non-restful sleep and daytime fatigue/sleepiness (ESS 12)

• No co-morbidity

• BMI 26  Neck size 15.5 inches  mild retrognathia

• PSG: AHI 7  RDI 14

• Impression: Mild OSA
Case 2 Question

Choose the most appropriate statement for this case

A. Weight loss is the best treatment option
B. Surgery is indicated as a second line treatment option
C. Oromandibular device may be considered as a first line treatment option
D. Nasal CPAP is not indicated
Case 2 Answer

Choose the most appropriate statement for this case

A. Weight loss is the best treatment option
B. Surgery is indicated as a second line treatment option
C. Oromandibular device may be considered as a first line treatment option
D. Nasal CPAP is not indicated
Case Example 3

- CU- 42 year old female, loud snoring, apneas with nasal congestion symptoms, daytime fatigue, ESS 8
- History of allergic rhinitis and seasonal asthma
- BMI 33   Neck size 15
- PSG- AHI 1   RDI 14
- **Impression:** Mild OSA
Case 3 Question

What is the best initial treatment option for this case?

1. Nasal CPAP as the initial treatment
2. Nasal surgery
3. Nasal steroids and decongestants
4. Oromandibular device
Case 3 Answer

What is the best initial treatment option for this case?

1. Nasal CPAP as the initial treatment
2. Nasal surgery
3. Nasal steroids and decongestants
4. Oromandibular device