OSA and CPAP Adherence: From the Behavioral Sleep Medicine Perspective

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What is Behavioral Sleep Medicine (BSM)?

• Sleep subspecialty area that focuses on the evaluation and treatment of sleep disorders by addressing the behavioral, psychological and physiological factors that interfere with sleep

• Multidisciplinary, inclusive of physicians, nurses, psychologists, and other allied health professionals
Outline

• OSA as a Syndrome

• CPAP Adherence:
  – Rates
  – Patterns
  – Correlates/determinants
  – Dose-response relationship
  – PAP Adherence interventions

• Review of our program of research on CPAP adherence interventions
OSA

• Sleep Apnea Syndrome
  – Often characterized by a range of daytime and nighttime symptoms
  – Symptoms only moderately correlate with OSA severity
  – Predominately obstructive
  – Prevalent in 2-4% of middle-aged adults, with higher rates in older adults, veterans, minorities
  – Meets all of the criteria for being a chronic illness
Clinical Presentation

- Chronic loud snoring
- Frequent nocturnal awakenings
- Gasping arousals
- Witnessed apneas
- Frequent nocturnal awakenings
- Frequent nocturia
- Frequent nocturia
- Non-restorative sleep
- Profuse sweating during sleep

- Excessive daytime sleepiness
- Wake with a dry mouth
- Wake with a headache
- Poor memory and concentration
- Daytime fatigue
- Changes in personality (impatient, easily irritated)

Consequences of Untreated OSA

- **Sleep and Sleepiness**
  - Sleep Fragmentation
  - Excessive Daytime Sleepiness
  - Nocturia
  - Depression?

- **Cardiovascular Effects**
  - Increased blood pressure
  - Increased stroke risk

- **Mortality**
  - AHI $\geq 5$ significantly associated with death (HR 1.97)

- **Impaired Cognitive Function**
  - Psychomotor vigilance
  - Accuracy
  - Sustained attention
  - Constructional abilities
  - Visuospatial learning
  - Executive function
  - Motor performance

- **Impaired Driving**
  - Increased risk of MVA
  - Impaired reaction times
  - Divided attention deficits

CPAP

• Multiple RCTs and meta-analyses show that CPAP is efficacious
• First-line therapy for OSA
• Methodological advantage of objective measurement of adherence as “time used at prescribed pressure”
• Efficacy data: residual AHI & mask leak
Adherence Rates

• What do we know about adherence rates?
  – Initial acceptance: ~75-80%\(^1\)
  – 50-60% of those continue to use at one year\(^1\)
  – <50% of all OSA pts are using CPAP at 1 year
  – ~50% are using it more than half of the night
  – 2 key goals:
    – acceptance, and
    – ongoing adherence

\(^1\) Engleman & Wild, 2003
Chart Review Project

- Retrospective examination of CPAP adherence data
- Access to CPAP clinic data downloads over a 3-year time period
- Each record was reviewed, CPAP data range was identified and summary data exported

Stepnowsky, et al 2006
Total Number of patient records in Encore on May 1, 2005

1569

Filtered listing from Encore (criteria: ≥ 7 nights usage)

1121

Duplicate pt. Entries: 74
"Bad Data": 155

892 cases

C-Flex (CPAP) Users

N = 648

New users: 439

Experienced users: 209

Other PAP types (APAP, CPAP, BiLevel, BiFlex)

N = 244

New users: 89

Experienced users: 155
### Sample Characteristics (n=528)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>59.6</td>
<td>12.0</td>
<td>25 - 92</td>
</tr>
<tr>
<td>RDI (baseline)</td>
<td>39.6</td>
<td>22.5</td>
<td>6 - 115</td>
</tr>
<tr>
<td>BMI (kg/m2) (baseline)</td>
<td>33.4</td>
<td>6.5</td>
<td>19.1 - 58.9</td>
</tr>
<tr>
<td><strong>Total # CPAP days</strong></td>
<td><strong>157.2</strong></td>
<td><strong>141</strong></td>
<td><strong>7 – 940</strong></td>
</tr>
<tr>
<td># days CPAP used</td>
<td>98.6</td>
<td>113.2</td>
<td>2 – 925</td>
</tr>
<tr>
<td># days CPAP not used</td>
<td>58.5</td>
<td>79.8</td>
<td>0 – 475</td>
</tr>
<tr>
<td>% days CPAP used</td>
<td>63%</td>
<td>31%</td>
<td>1 – 100%</td>
</tr>
</tbody>
</table>
## CPAP Adherence Rates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean use (all days)</td>
<td>3.1</td>
<td>2.5</td>
<td>0 – 9.3</td>
</tr>
<tr>
<td>Mean use (days used)</td>
<td>4.3</td>
<td>2.2</td>
<td>.03 – 9.3</td>
</tr>
<tr>
<td>Max use (one night)</td>
<td>8</td>
<td>2.9</td>
<td>.13 – 11.9</td>
</tr>
<tr>
<td>% of use &gt; 4 hrs</td>
<td>40%</td>
<td>35%</td>
<td>0 – 100%</td>
</tr>
<tr>
<td>% of use &lt; 4 hrs</td>
<td>60%</td>
<td>35%</td>
<td>0 – 100%</td>
</tr>
</tbody>
</table>
### TABLE 2. Average Adherence in Studies of 17 Disease Conditions

<table>
<thead>
<tr>
<th>Disease Conditions</th>
<th>No. of Studies</th>
<th>Mean Adherence (percent)*</th>
<th>Random Effects 95% Confidence Interval for Mean Adherence (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV disease</td>
<td>8</td>
<td>88.3</td>
<td>(78.9, 95.2)</td>
</tr>
<tr>
<td>Arthritis</td>
<td>22</td>
<td>81.2</td>
<td>(71.9, 89.0)</td>
</tr>
<tr>
<td>Gastrointestinal disorders</td>
<td>42</td>
<td>80.4</td>
<td>(73.9, 86.2)</td>
</tr>
<tr>
<td>Cancer</td>
<td>65</td>
<td>79.1</td>
<td>(75.9, 84.2)</td>
</tr>
<tr>
<td>Seizures/brain disorders</td>
<td>9</td>
<td>78.4</td>
<td>(52.4, 95.7)</td>
</tr>
<tr>
<td>Genitourinary and STDs</td>
<td>17</td>
<td>77.0</td>
<td>(65.4, 86.9)</td>
</tr>
<tr>
<td>Skin disorders</td>
<td>11</td>
<td>76.9</td>
<td>(66.5, 85.9)</td>
</tr>
<tr>
<td>Cardiovascular diseases†</td>
<td>129</td>
<td>76.6</td>
<td>(73.4, 79.8)</td>
</tr>
<tr>
<td>ENT and mouth disorders</td>
<td>30</td>
<td>76.1</td>
<td>(68.6, 82.8)</td>
</tr>
<tr>
<td>Blood disorders (not leukemia)</td>
<td>7</td>
<td>75.6</td>
<td>(45.9, 95.7)</td>
</tr>
<tr>
<td>OB-GYN</td>
<td>19</td>
<td>74.8</td>
<td>(64.2, 84.2)</td>
</tr>
<tr>
<td>Infectious disease</td>
<td>34</td>
<td>74.0</td>
<td>(67.5, 80.0)</td>
</tr>
<tr>
<td>Eye disorders</td>
<td>15</td>
<td>72.6</td>
<td>(61.8, 82.3)</td>
</tr>
<tr>
<td>End-stage renal disease</td>
<td>20</td>
<td>70.0</td>
<td>(56.8, 81.6)</td>
</tr>
<tr>
<td>Pulmonary diseases</td>
<td>41</td>
<td>68.8</td>
<td>(61.1, 76.2)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>23</td>
<td>67.5</td>
<td>(58.5, 75.8)</td>
</tr>
<tr>
<td>Sleep disorders</td>
<td>16</td>
<td>65.5</td>
<td>(54.3, 75.8)</td>
</tr>
</tbody>
</table>

*DiMatteo 2004*
CPAP Adherence Patterns of Use
**CPAP Adherence Patterns**

- Consistent and inconsistent users can be distinguished within the first week (Weaver et al, 1997; Aloia et al 2007)
- Adherence in week 1 associated with:
  - adherence at 6 months (Aloia et al 2007)
- Adherence at 1 month is associated with:
  - adherence at 3 months (Kribbs et al, 1993)
  - adherence at 6 months (Reeves-Hoche et al, 1994)
- Adherence at 3 months is associated with:
  - adherence at 22 months (McArdle et al, 1999)
One-year graphs

- Had opportunity to measure 1 yr of CPAP adherence data in 240 OSA pts
- Plotted nightly CPAP adherence over 365 days
Adherence Patterns Summary

• Adherence use patterns seem to be established early in the treatment initialization process
• Use patterns are variable; they tell a story
• This variability is important to monitor over time because it can help inform when to intervene when tracked prospectively
• Technologically we can do this
• Key issue: system not well set up to take advantage of it
Correlates of CPAP Adherence
Correlates of CPAP Adherence

- Patient/sociodemographic
  - Age, gender, education, body mass index, ethnicity
- OSA-related factors
  - OSA severity, sleepiness level, symptom level
- CPAP-related factors
  - Pressure level, side effects, mask leak
Correlates of Adherence

- Patient/sociodemographic
- OSA-related factors
- CPAP-related factors
- Psychological/behavioral change
- Health system-related factors
Behavior Change Models

- Examined Social Cognitive Theory (SCT) and Transtheoretical Model (TM)
- In a group of new users, SCT and TM factors found to be highly associated with CPAP adherence during 1st one-month of CPAP treatment (Stepnowsky et al 2004)
- In a group of users (2yrs), SCT and TM factors also highly associated with CPAP adherence (Stepnowsky et al, 2006)
- These are modifiable factors that could provide the basis for sound treatments, and have in other disease populations
Meta-Analysis of CPAP Correlates

- Goal: to identify all studies that examined CPAP correlates
- Method: Bottom-up search strategy
- Reviewed >6,000 abstracts
- 215 studies included in meta-analysis
- 76 correlates found across those studies
- Will report on the most common correlates
### Meta-Analysis of CPAP Correlates

<table>
<thead>
<tr>
<th></th>
<th>K</th>
<th>N</th>
<th>Mean r (95th CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>61</td>
<td>6901</td>
<td>0.14 (0.06 to 0.22)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>BMI</td>
<td>52</td>
<td>6458</td>
<td>0.10 (0.04 to 0.16)</td>
<td>&lt; 0.001</td>
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<tr>
<td><strong>OSA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHI</td>
<td>57</td>
<td>6252</td>
<td>0.09 (0.05 to 0.14)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>ESS</td>
<td>42</td>
<td>4750</td>
<td>0.14 (0.05 to 0.23)</td>
<td>&lt; 0.01</td>
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<tr>
<td><strong>CPAP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure</td>
<td>39</td>
<td>4384</td>
<td>0.09 (0.04 to 0.14)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
# Meta-Analysis of CPAP Correlates

<table>
<thead>
<tr>
<th></th>
<th>K</th>
<th>N</th>
<th>Mean r (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPAP Over Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPAP Side Effects</td>
<td>15</td>
<td>1600</td>
<td>-0.12 (-0.21 to -0.05)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Change in AHI</td>
<td>14</td>
<td>1162</td>
<td>0.34 (0.08 to 0.65)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Change in ESS</td>
<td>11</td>
<td>1236</td>
<td>0.31 (0.10 to 0.52)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Change in EDS</td>
<td>12</td>
<td>629</td>
<td>0.52 (0.23 to 0.93)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
Correlates Summary

• What do we know?
  – No set of factors exist at the time of treatment initialization that can help us *reliably* identify who will or will not be adherent with CPAP
  – Of the determinants studied, few could provide the basis for an intervention to increase adherence with CPAP

• What are we learning?
  – The *modifiable* determinants of compliance
  – How to influence the treatment initialization process so that adherence is maximized
Dose-Response Relationship

- **PAP “Dose”**  
  - Is function of pressure AND time
- **Pressure**  
  - Much focus on *initial* pressure determination  
  - *More* important is any required *future* changes
- **Time (or adherence)**  
  - Historically underappreciated and studied

Stepnowsky & Moore, 2004
RDI and ODI by Adherence

Stepnowsky et al 2004
Figure 1—Cumulative proportion of participants obtaining normal threshold values on the Epworth Sleepiness Scale (ESS), Multiple Sleep Latency Test (MSLT), and Functional Outcomes of Sleep Questionnaire (FOSQ). A cumulative proportion function was applied to the data in Table 3. CPAP refers to continuous positive airway pressure.
Summary: Rates, Patterns, Correlates, Dose

- CPAP adherence rates can be improved
- OSA patients generally establish patterns early in the treatment initialization process, though there is variability in use over time
- Modifiable correlates of CPAP adherence can provide the basis for interventions to help improve CPAP adherence
- CPAP prescribed for use whenever asleep
CPAP Adherence Interventions
CPAP Adherence Interventions

• Educational support
• Clinical support
  – Mechanical (PAP Type, Mask, Humidification, Titration)
  – Intensive or augmented clinical support
• Psychological/Behavioral Change support
Adherence Interventions - Mechanical

- Cochrane review (Haniffa et al, 2006)
  - No difference in APAP vs. CPAP
  - No difference for bi-level
  - Patient-titrated – no difference
  - Mask/humidification

- **Summary:** Mechanical improvements clearly have a role for comfort, but do not appear to be *independently* related to adherence
Clinical Support Interventions

- Group clinical support sessions increased compliance by 1.1 hrs/nt; no control group & retrospective (Likar et al, 1997)
- Prospective, RCT of intensive support (5.4 hrs/nt) vs. standard support (3.9 hrs/nt) (Hoy et al, 1999)
- No difference found between basic-support (5.3 h/nt) and augmented-support (5.5 h/nt) in a clinic sample (Hui et al, 2000)
Psychological/Behavioral Change Interventions

- Motivational Enhancement
  - Two individual group sessions by trained professional
  - Based on principles of motivational interviewing
  - No difference between ME group and standard care group

Adherence Interventions

Cognitive-Behavioral Therapy
- Combination education, clinical support and behavioral change, based in part on SCT
- Two 1 hour sessions, group based with 10 participants and their spouses
- Found ~2 hr/nt difference b/w CBT and UC
- Comparator group was limited, which might in part explain effect found in this study

Richards et al 2007
Chronic Illness Care - IOM

• What patients with chronic illnesses need:
  – A “continuous, healing relationship”
  – Regular assessments of how they are doing
  – Effective clinical management
  – Information and ongoing support for self-management
  – Shared care plan
  – Active, sustained follow-up
Chronic Care Model

Community
- Resources and Policies
  - Self-Management Support

Health System
- Health Care Organization
  - Delivery System Design
  - Decision Support
  - Clinical Information Systems

Improved Patient Outcomes

Informed, Activated Patient

Productive Interactions

Prepared, Proactive Practice Team

MacColl Institute
(1) CPAP Telemonitoring Project
CPAP Telemonitoring Project

- Randomized trial comparing two groups:
  - Usual clinical care (UC)
    - 1-wk phone call; 1-mo visit; prn visits
  - Enhanced clinical care (EC)
    - EC receive tailored feedback from clinical staff based on wireless data collection
- Both groups received identical equipment
- 20 patients per group
- 2-month intervention period

Stepnowsky et al, 2007
Clinical Care Differences

• Both EC and UC have data access
  – EC – Daily data access
  – UC – Monthly data access

• EC providers can proactively intervene
  – UC providers limited to time points
  – However, patients could always call/drop-in

• Key differences were initial 30 day period and daily access by EC.
CPAP wireless data system


Data transmitted via GPS network next day in store & forward manner

Other similar systems are on the market
## ResTraxx Data Center

**Report Date:** September 21, 2005  
**Physician:**  
**Date Of Birth:**  
**Total Days Monitored:** 63  
**Compliance Percentage:** 87.3%

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Summary</th>
</tr>
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<tbody>
<tr>
<td>22</td>
<td>23 🎈</td>
<td>24 🎈</td>
<td>25 🎈</td>
<td>26 🎈</td>
<td>27 🎈</td>
<td>28 🎈</td>
<td></td>
</tr>
<tr>
<td>29 🟢</td>
<td>30 🟢</td>
<td>31 🟢</td>
<td>1 🟢</td>
<td>2 🟢</td>
<td>3 🟢</td>
<td>4 🟢</td>
<td>66.7%</td>
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<tr>
<td>5 🟢</td>
<td>6 🟢</td>
<td>7 🟢</td>
<td>8 🟢</td>
<td>9 🟢</td>
<td>10 🟢</td>
<td>11 🟢</td>
<td>100%</td>
</tr>
<tr>
<td>12 🟢</td>
<td>13 🟢</td>
<td>14 🟢</td>
<td>15 🟢</td>
<td>16 🟢</td>
<td>17 🟢</td>
<td>18 🟢</td>
<td>85.7%</td>
</tr>
<tr>
<td>19 🟢</td>
<td>20 🟢</td>
<td>21 🟢</td>
<td>22 🟢</td>
<td>23 🟢</td>
<td>24 🟢</td>
<td>25 🟢</td>
<td>28.6%</td>
</tr>
</tbody>
</table>
Provider
Treatment
Algorithm:
Green/green pathway
Provider Treatment Algorithm:

Red/yellow pathway

- Low Adherence
  - Assess Problem
  - Consider:
    - Side effects
    - Claustrophobia
    - Difficulty breathing
  - See Intervention Matrix
  - Continue Monitoring

- High Leak
  - Assess Problem
  - Consider:
    - Mask
    - Nasal/Oral
    - Pressure
  - See Intervention Matrix
  - Continue Monitoring

- High AHI
  - Assess Problem
  - Consider:
    - Pressure too low
    - APAP trial
  - Increase Pressure
  - Continue Monitoring
**Sample Characteristics**  

* There were no significant differences on any of these sample characteristic variables between the 2 groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>59</td>
<td>14.3</td>
<td>23-80</td>
</tr>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>32.8</td>
<td>5.7</td>
<td>26.0-45.9</td>
</tr>
<tr>
<td>Apnea-Hypopnea Index (AHI)</td>
<td>39</td>
<td>16.8</td>
<td>20.7-93.7</td>
</tr>
<tr>
<td>Oxygen Desat Index (ODI)</td>
<td>43.4</td>
<td>20.1</td>
<td>16.5-89.3</td>
</tr>
<tr>
<td>CPAP pressure (cm H₂O)</td>
<td>10.3</td>
<td>1.6</td>
<td>8-13</td>
</tr>
<tr>
<td>Epworth Sleepiness Scale</td>
<td>12.6</td>
<td>5.8</td>
<td>4-23</td>
</tr>
<tr>
<td>FOSQ</td>
<td>13.8</td>
<td>3.8</td>
<td>6.2-19.3</td>
</tr>
</tbody>
</table>
Results: CPAP adherence level by Group

![Bar chart showing CPAP adherence levels]

Adherence (hrs/night)

- Usual: 2.8 hours/night
- Enhanced: 4.1 hours/night

p-value = .07
Results: Mean Leak by Group

p-value = .07
Telemonitoring Study Conclusions

• Wireless CPAP telemonitoring resulted in a trend for higher CPAP adherence levels and lower mask leak levels at 2-months
• No difference in AHI levels
• This data can be useful in guiding the collaborative management of OSA by CPAP
• This study only examined the proactive follow-up by the CPAP therapist
(2) Sleep Apnea Self-Management Program (SASMP)
SASMP Intervention

• Self-Management Training
  – Based on CDSMP at Stanford, but adapted for newly diagnosed OSA patients
  – 4 group-based sessions with 4-6 pts per group
    • Grp 1 prior to sleep study; Grp 2 CPAP set-up
    • Grps 3 and 4 are followup, and includes review of data
  – Pilot study showed that at end of 1 month, adherence = 5.5 hrs/night

Stepnowsky et al, 2007
Self-Management Support

- Emphasize the patient’s central role
- Assess patient’s beliefs, behaviors, knowledge
- Advise patients by providing personalized information
- Agree on collaboratively set goals
- Assist patients with problem-solving
- Arrange a specific follow-up plan
240 veterans diagnosed with OSA included
SASMP group comprised of:
- Session 1: OSA education and home sleep testing set-up
- Session 2: CPAP education and set-up; Self-management instruction
- Sessions 3 & 4: Self-management follow-up and troubleshooting
SASMP Results:
1 month
Effect of SASMP on Behavioral Change Variables

The two groups differed on measures of SCT at one-month with those in the SM group having higher levels and self-efficacy and outcome expectations (UC vs. SM, respectively): Outcome Expectations (-0.21 vs. 0.05, p=.02) and Self-Efficacy (-0.39 vs. 0.09; p<.001)
SASMP Conclusions

• Advantages:
  – Designed for new users
  – Group format allows for peer support

• Disadvantages:
  – Can be difficult to get group continuity in a clinical environment
  – Sharing of experiences and data are important for the group process to work
(3) MyCPAP Website Intervention
Study objective

• Develop and evaluate an interactive web-based CPAP adherence intervention

• Key features:
  – Telemonitoring of CPAP adherence and efficacy data
  – Feeding that data back to both patients and providers
  – Create online resource for participants
Methods

• Randomized, controlled trial comparing two groups:
  – Usual Care (UC)
  – Patient-Centered, Collaborative Care (PC3)

• 120 patients per group

• Recruited from UCSD Sleep Clinic
  – Supplemented by word-of-mouth referrals

• Inclusion criteria: \( \text{AHI} \geq 10 \)
Provider Side: CPAP Telemonitoring Using ResTraxx Data Center (RDC):

- Demographics – background data
- Prescription – allows for setting of thresholds
- Monitoring – calendar format reporting of data
- Compliance

- All for provider access (ie, no patient access)
Patient Side: PC3 Website

- Interactive website designed to “off-load” those tasks that are repetitive to provider:
  - Learning Center – OSA and CPAP
  - Reference Manual
  - My Charts
  - Troubleshooting Guide
PC3 Website Login

Virtual CPAP Clinic Home

Welcome!

The University of California at San Diego's Department of Medicine and the California Institute for Telecommunications and Information Technology have developed this website, called The Virtual CPAP Clinic, designed specifically for sleep apnea sufferers who want to control their disease and improve their lives. We invite you to come in, explore the site, and discover for yourself how you can make a positive difference in your health.

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Please Sign In

User Name:

Password:

Remember me next time.

Sign in

Sponsored by

VA San Diego Medical Center

The California Institute for Telecommunications and Information Technology
PC3 Website Homepage

Welcome carl!

Thank you for signing in today, Friday, June 10, 2011.

It looks as though you have not yet completed your Baseline assessment. Please [click here](#) to begin your baseline assessment.

[Click here](#) to view your latest CPAP data.
Learning Center

Part 1: Obstructive Sleep Apnea
Lesson 1: What is Obstructive Sleep Apnea?
Lesson 2: Why Sleep Apnea is not just snoring
Lesson 3: How you know you have Sleep Apnea
Lesson 4: What Sleep Apnea feels like
Lesson 5: Sleep Apnea being a vicious cycle
Lesson 6: How Sleep Apnea affects your body
Lesson 7: Why you have Sleep Apnea

Part 2: CPAP
Lesson 1: CPAP
Lesson 2: What CPAP looks and feels like
Lesson 3: How to use CPAP
Lesson 4: Adjusting to CPAP
Lesson 5: How CPAP benefits you
MyCharts Page

The data on this page displays the average values of your CPAP data since the start of treatment. The average values are a general indication of how your treatment is progressing.

**Nightly Average to Date**

- Usage (hours): 5:40
- AH1 (events/hour): 4.37
- Leak (liters/sec): .12

You may drill further into the data by selecting the links on the right.
CPAP Adherence data

My Usage Chart - Windows Internet Explorer

Virtual CPAP Clinic Home > My Charts > My Usage Chart

Nightly CPAP Usage

- Usage is the amount of time CPAP is in use during a single night
- The recommended nightly minimum usage is 4 hours (shown in green)

Next Done
CPAP Residual AHI Data

- The Apnea-Hypopnea index (AHI) is the number of apneas/hypopneas occurring per hour of CPAP use.
- An AHI below 10 events/hour is considered ‘normal’.
- An AHI above 10 events/hour indicates a need for additional CPAP management.
CPAP Leak Data

Nightly Average Leak

- Average leak is an indication of much air is escaping from your mask per hour of CPAP use.
- Average leak less than 0.4 liters/sec is considered 'normal'.
- Average leak above 0.4 liters/sec is an indication that your mask or fittings may require attention.

Previous Done
Troubleshooting & Manual

Virtual CPAP Clinic Home > Troubleshooting

We hope that you aren’t experiencing any problems with your CPAP treatment, but in case you are, this is the part of the website where you can look up solutions for some commonly experienced problems. As you will see, most of the corrections can be done by you at home. Some, however, require that you contact your care provider. If contact is necessary we will help you do so.

*Note: If you would like to print out a complete list of problems and their possible corrections included in this section, simply click on the icon “Full List of Troubleshooting” below and print the page. You can post this list near where you sleep in case you experience some of these problems.*

Click Here
if you would like to troubleshoot problems using your CPAP

Click Here
if you would like to view the CPAP Machine Reference Guide
CPAP Adherence level (in hrs/nt) Between UC and PC3 at 2-months

p-value=.016; d-index = 0.34
CPAP Adherence level (in hrs/nt) Between UC and PC3 at 4-months

p-value=.035; d-index = 0.30
CPAP Intervention Limitations

- Limitations of interventions studied to date:
  - Is an extra 1-1.5 hours of CPAP per night clinically meaningful?
  - Intensive support protocols may not feasible for most sleep clinics to implement, so important to continue to evaluate time-limited interventions such as MET, CBT, or self-management
  - Which providers will deliver and in what settings?
Key Issues

• OSA severity
  – CPAP clearly indicated for those with moderate and severe OSA
  – Less clear for mild OSA or for those with positional OSA

• 2009 AASM guidelines recommend other therapies as secondary options (e.g., oral appliances; positional therapy; weight loss)
Future Research Issues

• 1) Role of Patient education
  – Perhaps look to diabetes model?

• 2) Use of the Chronic Care Model as overarching framework
  – Idea of patient-centered, collaborative care
  – How to incorporate other team members?
Future Research Issues, con’t

• 3) Role of health information technology?
  – Take advantage of objectively measured CPAP data
  – What format or method?
    • Manual download, smart card, wired/wireless modem
    • How do we incorporate with EMR and EHR?
    • Role of mobile technologies?
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Thank you

Questions?