Sleep and Self-care Prevention for the Nurse

Sandra A. Carey, PhD, MPH, CCRN, ANP-BC
Disclosures

- I serve as a consultant for both Respica®rdia and Itamar Medical™
Objectives

By the end of this presentation, you will be able to...

- Describe/Educate on Sleep Hygiene
- Describe/Educate on Sleep Disorders and its impact on overall health
- Describe and discuss occupation hazards for sleep deprivation in Nursing
- Discuss the contribution of sleep-disordered breathing to the development and progression of heart failure.
- Discuss types of sleep apnea, screening, testing and current treatment modalities
Sleep Hygiene
<table>
<thead>
<tr>
<th>Age Group</th>
<th>Recommended Hours of Sleep Per Day</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn</td>
<td>0–3 months</td>
<td>14–17 hours (National Sleep Foundation)</td>
</tr>
<tr>
<td>Infant</td>
<td>4–12 months</td>
<td>12–16 hours per 24 hours (including naps) (American Academy of Sleep Medicine)</td>
</tr>
<tr>
<td>Toddler</td>
<td>1–2 years</td>
<td>11–14 hours per 24 hours (including naps)</td>
</tr>
<tr>
<td>Preschool</td>
<td>3–5 years</td>
<td>10–13 hours per 24 hours (including naps)</td>
</tr>
<tr>
<td>School Age</td>
<td>6–12 years</td>
<td>9–12 hours per 24 hours</td>
</tr>
<tr>
<td>Teen</td>
<td>13–18 years</td>
<td>8–10 hours per 24 hours</td>
</tr>
<tr>
<td><strong>Adult</strong></td>
<td>18–60 years</td>
<td><strong>7 or more hours per night</strong></td>
</tr>
<tr>
<td></td>
<td>61–64 years</td>
<td>7–9 hours</td>
</tr>
<tr>
<td></td>
<td>65 years and older</td>
<td>7–8 hours</td>
</tr>
</tbody>
</table>

1.CDC.Gov
Factors That Impact Sleep Quality

- Sleep environment sleep habits' (traffic/television noise, room temperature, excessive lighting, irregular sleep schedule, and changes in sleep hours)
- Emotional stress (e.g., nervousness, hostility, anxiety, and depression)
- Eating habits (e.g., diet, consumption of drinks with caffeine and/or alcohol, and tobacco use;)
- Exercise (e.g., inactivity, exercise with inappropriate intensity/duration, and lack of aerobic exercise;)
- Physiologic changes (e.g., changes in neuroendocrine hormones, body temperature, pregnancy; menopause; and disease symptoms)
What is Sleep Hygiene

- Strong sleep hygiene means having both a bedroom environment and daily routines that promote consistent, uninterrupted sleep.
- Keeping a stable sleep schedule, making your bedroom comfortable and free of disruptions.
- Following a relaxing pre-bed routine.
- Building healthy habits during the day can all contribute to ideal sleep hygiene.
The 10 Sleep Hygiene Commandments

1. Exercise regularly
2. Get sunlight during the day
3. Keep your bedroom cool, dark and comfortable
4. Don't go to bed too hungry or too full
5. Avoid excessive liquid consumption in the evening
6. No caffeine, nicotine or alcohol near bedtime
7. Don't go to bed angry, worried or upset
8. Avoid digital devices in the bedroom and don't use your phone as an alarm clock
9. Don't nap too long or too late during the day
10. Set regular schedule for sleep and stick to it even during weekends and holidays

HappyMaven
Sleep Disorders and its impact on overall health
Unmet Public Health Problem

- It is estimated 50 to 70 million Americans suffer from a chronic disorder of sleep and wakefulness.
- Billions of dollars annually are spent on direct medical costs hospital services, prescriptions, and over-the-counter medications.
- Nearly 20% of all serious MVA in the general population are associated with driver sleepiness, independent of alcohol effects.
- However, given this burden, awareness among the general public and health care professionals is low.
- **The current clinical and scientific workforce is not sufficient to diagnose and treat individuals with sleep disorders.**

http://www.nap.edu/catalog/11617.html
The cumulative long-term effects of sleep deprivation and sleep disorders have been associated with a wide range of deleterious outcomes, to include increased risk of hypertension, diabetes, obesity, depression, heart attack, and stroke.

The majority of people with sleep disorders are frequently under diagnosed. Compared to healthy individuals, those suffering from sleep loss and sleep disorders are less productive, have an increased health care utilization, and have an increased likelihood of injury.
Occupation Hazards for Sleep Deprivation in Nursing
Shift Work

- Shift work is a significant health risk factor in nursing.
- Disruption of sleep-wake cycle in shift workers causes symptoms such as fatigue, drowsiness, insomnia, digestive problems, irritability, decreased mental activity, and degradation of individual performance.
- Work productivity and safety in night shift is at its lowest.
- Shift work increases the risk of some diseases in long-term. These include the risk of cardiovascular disease, diabetes, mood disorders, and cancers.
- One of the most common problems in shift workers is shift work sleep disorders (SWSD).

Yazdi Z, Jalilolghadr S, Tootoonchian F. J Sleep Sci 2017
SWSDs are caused by disruption of circadian rhythm of sleep and wake and are characterized by excessive daytime sleepiness and insomnia.

The prevalence of SWSDs is more than 30% in shift workers and its prevalence increase with aging.

Due to the high prevalence of SWSDs, research has been aimed at training shift workers appropriate sleep hygiene.
Tips to improve sleep and alertness

- Get some exercise and eat light, healthy meals and snacks during your shift.
- Keep the work environment brightly lit.
- After a night shift, wear sunglasses or amber-tinted glasses when outside.
- To reduce the potential for drowsy driving, get a ride, take a cab or public transit, or use a ridesharing service.
- Avoid caffeine.
- Prioritize your sleep: avoid running errands or doing chores after your shift.
- Never use alcohol as a sleep aid.
- Turn off mobile devices before going to bed.
Are you putting yourself at risk?

- Given the large numbers of nurses who report struggling to stay awake when driving home from work and the frequency with which nurses reported drowsy driving, greater attention should be paid to increasing nurse awareness of the risks and to implementing strategies to prevent drowsy driving episodes to ensure public safety.

- **Without mitigation, fatigued nurses will continue to put the public and themselves at risk.**

Scott, Hwang, Rogers, Nysse, Dean; Dinges *SLEEP* 2007
The contribution of sleep-disordered breathing (SDB) to the development and progression of heart failure.
Systemic Effects of SDB
Sleep Apnea Syndromes and HF

- CSA
- OSA
- Rostral Fluid Movement, Pharyngeal Obstruction
- Hypoxia, Oxidative stress, Systemic inflamm, Sympathetic activ, Elev BP
- Heart Failure

UA occluded
UA obstruction
Hypoxic PA vasoconstriction
LV transmural pressure
↓ Venous return, Exaggerated negative intrathoracic pressure

References:
Mentz RJ, et al. Heart Fail Clin 2013
# Prevalence and Predictors of Sleep-Disordered Breathing in Patients With Stable Chronic Heart Failure

The SchlaHF Registry

Michael Arzt, MD,† Holger Woehrle, MD,‡ Olaf Oldenburg, MD,§ Andrea Graml, Dir. SrN,∥ Anna Suling, PhD,⁴ Erland Erdmann, MD,† Helmut Teschler, MD,§ Karl Wegscheider, PhD,⁴ for the SchlaHF Investigators

## TABLE 4 Risk Factors for SDB in Chronic Heart Failure

<table>
<thead>
<tr>
<th>First Author, Year (Ref.)</th>
<th>Setting</th>
<th>Patients (n)</th>
<th>Source of Patients</th>
<th>SDB Diagnosis</th>
<th>Female, n (%)</th>
<th>β-Blocker (%)</th>
<th>Spironolactone (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sin et al., 1999 (13)</td>
<td>Single center</td>
<td>450</td>
<td>Sleep laboratory referrals</td>
<td>PSG</td>
<td>68 (15)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Yumino et al., 2009 (14)</td>
<td>Single center</td>
<td>218</td>
<td>Heart failure clinic</td>
<td>PSG</td>
<td>50 (23)</td>
<td>75</td>
<td>21</td>
</tr>
<tr>
<td>MacDonald et al., 2008 (26)</td>
<td>Single center</td>
<td>108</td>
<td>Heart failure clinic</td>
<td>SDB-screening device</td>
<td>16 (15)</td>
<td>82</td>
<td>36</td>
</tr>
<tr>
<td>Arzt et al. (SchlaHF)</td>
<td>Multicenter</td>
<td>6,876</td>
<td>Cardiology practices and hospital departments</td>
<td>SDB-screening device</td>
<td>1,448 (21)</td>
<td>89</td>
<td>47</td>
</tr>
</tbody>
</table>

### Risk Factors for SDB

- CSA: male, age ≥60 yrs, Po2 ≤38 mm Hg, AF
- OSA: BMI (men): age (women)
- CSA: male, age, AF, lower Po2, diuretic use
- OSA: male, age, BMI
- SDB: AF, NYHA functional class

AF = atrial fibrillation; CSA = central sleep apnea; OSA = obstructive sleep apnea; Po2 = carbon dioxide pressure; PSG = polysomnography; pts = patients; SchlaHF = Sleep-Disordered Breathing in Heart Failure; other abbreviations as in Table 1.
Sleep Apnea is an Interruption in Breathing During Sleep

Complex

Controversy remains as to whether complex sleep apnea represents an independent and sustained sleep related breathing disorder, or whether it is a temporary occurrence that eventually abates with continued PAP therapy.

Further studies to resolve this debate are warranted*

*American Academy of Sleep Medicine, 2016
**OBSTRUCTIVE SLEEP APNEA**

Most common Sleep Apnea caused by Blockage of Airway
Often Causes loud snoring

**CENTRAL SLEEP APNEA**

Not caused by airway Blockage
The brain does not signal the muscles to breath Does not Typically Cause snoring

**COMPLEX SLEEP APNEA**

A combination of Obstructive and Central Sleep Apnea
## Definition of Sleep-Related Breathing Disorders

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apnea</td>
<td>Cessation of airflow for at least 10 seconds or more</td>
</tr>
<tr>
<td>Hypopnea</td>
<td>Reduction of airflow with resultant oxygen desaturation of $\geq 4%$</td>
</tr>
<tr>
<td>Apnea-hypopnea index</td>
<td>Average frequency of apnea and hypopnea events per hour of sleep</td>
</tr>
<tr>
<td>Obstructive sleep apnea</td>
<td>AHI of $\geq 15$ or $\geq 5$ associated symptoms such as excessive daytime sleepiness, impaired cognition, mood disorders, insomnia, hypertension, heart disease, or history of stroke</td>
</tr>
<tr>
<td>Central sleep apnea</td>
<td>AHI of $\geq 5$ or $\geq 50%$ of the respiratory events occurring without any inspiratory effort—associated with symptoms of either excessive daytime sleepiness or disrupted sleep</td>
</tr>
</tbody>
</table>

*Note: It is the presence of inspiratory effort during apneas and hypopneas that distinguishes predominantly obstructive sleep apnea (OSA) from central sleep apnea (CSA).*
Sleep Disordered Breathing is a Predictor of Mortality in HF Patients

Survival – Heart failure (LVEF< 45%) with CSA patients vs. heart failure with normal breathing in NIH sponsored study

HF combined with CSA is associated with a 2-fold increase in risk of death

<table>
<thead>
<tr>
<th>Hazard ratios</th>
<th>CSA vs. no or minimal SDB</th>
<th>OSA vs. no or minimal SDB</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.17 p &lt; 0.001</td>
<td>2.00 p &lt; 0.001</td>
<td></td>
</tr>
</tbody>
</table>

Khayat et al. Eur Heart J 2015; 36:1463-9
Screening, Testing and New Therapy Options ....oh my!

“OK, Mrs. Tully. We want you to relax, get a good night’s sleep, and we’ll evaluate any sleep issues that you have.”
Pre-Screening Tools – What is the right questionnaire?
It is especially important for patients in high-risk groups to be screened using a validated OSA questionnaire (e.g., STOP-BANG or Berlin).

Because:

“Sleep Apnea Hurts HEARTS,” the American Academy of Sleep Medicine recommends an annual screening for all adult patients who have:

- H – heart failure
- E – elevated blood pressure
- A – atrial fibrillation (A-fib)
- R – resistant hypertension
- T – Type 2 diabetes
- S – stroke
### 9.6. Sleep-Disordered Breathing: Recommendations

(Moved from Section 7.3.1.4, Treatment of Sleep Disorders in the 2013 HF guideline.)

#### Recommendations for Treatment of Sleep Disorders

<table>
<thead>
<tr>
<th>COR</th>
<th>LOE</th>
<th>RECOMMENDATIONS</th>
<th>COMMENT/RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>C-LD</td>
<td>In patients with NYHA class II-IV HF and suspicion of sleep-disordered breathing or excessive daytime sleepiness, a formal sleep assessment is reasonable (200,201).</td>
<td>NEW: Recommendation reflects clinical necessity to distinguish obstructive versus central sleep apnea.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sleep disorders are common in patients with HF. A study of adults with chronic HF treated with evidence-based therapies found that 67% had either central or obstructive sleep apnea (202). It is clinically important to distinguish obstructive sleep apnea from central sleep apnea, given the different responses to treatment. Adaptive servo-ventilation for central sleep apnea is associated with harm (203). Continuous positive airway pressure (CPAP) for obstructive sleep apnea improves sleep quality, reduces the apnea-hypopnea index, and improves nocturnal oxygenation (200,201).</td>
<td></td>
</tr>
<tr>
<td>ib</td>
<td>B-R</td>
<td>In patients with cardiovascular disease and obstructive sleep apnea, CPAP may be reasonable to improve sleep quality and daytime sleepiness (204).</td>
<td>NEW: New data demonstrate the limited scope of benefit expected from CPAP for obstructive sleep apnea.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In patients with sleep apnea, a trial evaluated the impact of CPAP with usual therapy versus usual therapy alone on subsequent cardiovascular events, including HF (204). In this RCT of &gt;2,700 patients, there was no evidence of benefit on cardiovascular events at a mean follow-up of 3.7 years for CPAP plus usual care compared with usual care alone. Improvements in sleep quality were noteworthy and represented the primary indication for initiating CPAP treatment (204). However, in patients with atrial fibrillation (AF) (a frequent comorbidity noted with HF), the use of CPAP for obstructive sleep apnea was helpful. In a trial of 10,132 patients with AF and obstructive sleep apnea, patients on CPAP treatment were less likely to progress to more permanent forms of AF than were patients without CPAP (205).</td>
<td></td>
</tr>
<tr>
<td>m-HR</td>
<td>B-R</td>
<td>In patients with NYHA class II-IV HF and central sleep apnea, adaptive servo-ventilation causes harm (203).</td>
<td>NEW: New data demonstrate a signal of harm when adaptive servo-ventilation is used for central sleep apnea.</td>
</tr>
</tbody>
</table>

Mortality rates (all cause and cardiovascular) are higher with adaptive servo-ventilation than CPAP plus usual care in a pivotal RCT in the...
### Testing Recommendations for suspected Sleep Apnea

1. **(Strong)** Use of clinical tools or questionnaires to help diagnose, specifically in the absence of recent PSG or HST

2. **(Strong)** Testing with either PSG or HST be used to diagnose OSA in the uncomplicated adult patient with increased risk profile for OSA

3. **(Strong)** If a single home study test is negative, inconclusive or technically inadequate repeat PSG for confirmation of diagnosis of OSA

<table>
<thead>
<tr>
<th>Recommendation Statement</th>
<th>Strength of Recommendation</th>
<th>Evidence Quality</th>
<th>Benefits versus Harms</th>
<th>Patient Values and Preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. We recommend that clinical tools, questionnaires or prediction algorithms not be used to diagnose OSA in adults, in the absence of PSG or HST.</td>
<td>Strong</td>
<td>Moderate</td>
<td>High certainty that harms outweigh benefits</td>
<td>Vast majority of well-informed patients would most likely not choose clinical tools, questionnaires or prediction algorithms for diagnosis.</td>
</tr>
<tr>
<td>2. We recommend that PSG, or HSAT with a technically adequate device, be used for the diagnosis of OSA in uncomplicated adult patients presenting with signs and symptoms that indicate an increased risk of moderate to severe OSA.</td>
<td>Strong</td>
<td>Moderate</td>
<td>High certainty that benefits outweigh harms</td>
<td>Vast majority of well-informed patients would want PSG or HSAT.</td>
</tr>
<tr>
<td>3. We recommend that if a single HSAT is negative, inconclusive or technically inadequate, PSG be performed for the diagnosis of OSA.</td>
<td>Strong</td>
<td>Low</td>
<td>High certainty that benefits outweigh harms</td>
<td>Vast majority of well-informed patients would want PSG performed if the initial HSAT is negative, inconclusive, or technically inadequate.</td>
</tr>
<tr>
<td>4. We recommend that PSG, rather than HSAT, be used for the diagnosis of OSA in patients with significant cardiopulmonary disease, potential respiratory muscle weakness, due to neuromuscular condition, awake hyperventilation or suspicion of sleep related hyperventilation, chronic opioid medication use, history of stroke or severe insomnia.</td>
<td>Strong</td>
<td>Very Low</td>
<td>High certainty that benefits outweigh harms</td>
<td>Vast majority of well-informed patients would most likely choose PSG to diagnose suspected OSA.</td>
</tr>
<tr>
<td>5. We suggest that, if clinically appropriate, a split-night diagnostic protocol, rather than a full-night diagnostic protocol for PSG be used for the diagnosis of OSA.</td>
<td>Weak</td>
<td>Low</td>
<td>Low certainty that benefits outweigh harms</td>
<td>Majority of well-informed patients would most likely choose a split-night diagnostic protocol to diagnose suspected OSA.</td>
</tr>
<tr>
<td>6. We suggest that when the initial PSG is negative, and there is still clinical suspicion for OSA, a second PSG be considered for the diagnosis of OSA.</td>
<td>Weak</td>
<td>Very Low</td>
<td>Low certainty that benefits outweigh harms</td>
<td>Majority of well-informed patients would most likely choose a second PSG to diagnose suspected OSA when the initial PSG is negative and there is still a suspicion that OSA is present.</td>
</tr>
</tbody>
</table>
Home Sleep Testing
Diagnostic Options in the Setting of a Pandemic
What is WatchPat®?

HST is an alternative to PSG in the diagnosis of potentially both obstructive and central sleep apnea.

Patients can be evaluated in their own habitual environment rather than in a sleep lab.

The use of HST provides a less stress-inducing option for patients and a more financially efficient method for the evaluation of SAS.

One HST test option utilizes the peripheral arterial signal testing measuring (peripheral arterial tonometry, heart rate, oximetry, actigraphy, body position, snoring and chest motion) via three points of contact (wrist, finger and chest).
What is Home Sleep Testing?
Diagnostic Capabilities

Sleep Study Report

Sleep Summary

- **Start Study Time:** 2:40:16 AM
- **End Study Time:** 7:45:05 AM
- **Total Recording Time:** 5 hrs, 4 min
- **Total Sleep Time:** 4 hrs, 25 min
- **% REM of Sleep Time:** 14.2

Respiratory Indices

<table>
<thead>
<tr>
<th>Indices</th>
<th>Total Events</th>
<th>REM</th>
<th>NREM</th>
<th>All Night</th>
</tr>
</thead>
<tbody>
<tr>
<td>pRDI</td>
<td>34</td>
<td>9.7</td>
<td>7.4</td>
<td>7.7</td>
</tr>
<tr>
<td>pAHI</td>
<td>32</td>
<td>8.0</td>
<td>7.1</td>
<td>7.3</td>
</tr>
<tr>
<td>ODI</td>
<td>8</td>
<td>3.2</td>
<td>1.6</td>
<td>1.8</td>
</tr>
<tr>
<td>pAHIc</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>% CSR</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Indices are calculated using technically valid sleep time of 4 hrs, 24 min.

Oxygen Saturation Statistics

- **Mean:** 93
- **Minimum:** 87
- **Maximum:** 98
- **Mean of Desaturations Nadirs (%):** 91

<table>
<thead>
<tr>
<th>Oxygen Desatur. %:</th>
<th>4-9</th>
<th>10-20</th>
<th>&gt;20</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Events Number</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Oxygen Saturation:

- **<90:** 2.6
- **<85:** 0.4
- **<80:** 0.0
- **<70:** 0.0

Duration (minutes):

- **Sleep %:** 1.0
- **<0.1:** 0.0
- **<0.0:** 0.0
- **<0.0:** 0.0

Pulse Rate Statistics during Sleep (BPM)

- **Mean:** 46
- **Minimum:** 40
- **Maximum:** 83

Body Position Statistics

- **Position:** Supine, Prone, Right, Left, Non-Supine

Snoring Statistics

- **Snoring Level (dB):** >40, >50, >60, >70, >80
- **Threshold (dB):** Mean: 40 dB

Sleep Stages

- **Sleep Latency (min):** 20.0
- **REM Sleep (min):** 10.0
- **% Waking:** 10.0

*Reference values are according to AASM guidelines

Baylor Scott & White
Baylor University Medical Center
RESEARCH INSTITUTE
Limited Treatment Options for **Central Sleep Apnea**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPAP</strong></td>
<td>Most common CSA treatment</td>
</tr>
<tr>
<td></td>
<td>Clinical trials demonstrated improvement in AHI and EF</td>
</tr>
<tr>
<td></td>
<td>CANPAP showed no improvement in QoL or M&amp;M and was stopped early for safety</td>
</tr>
<tr>
<td></td>
<td>Does not have an FDA approved indication to treat CSA</td>
</tr>
<tr>
<td><strong>ASV (Adaptive servo-ventilation)</strong></td>
<td>Largest randomized study in CSA (SERVE-HF n=1325)</td>
</tr>
<tr>
<td></td>
<td>Showed and improvement in AHI but no improvement in QoL</td>
</tr>
<tr>
<td></td>
<td>No difference in M&amp;M, but increased cardiovascular mortality in patients with EF &lt; 45%</td>
</tr>
<tr>
<td></td>
<td><strong>Black box warning</strong> and Class III recommendation against use in patients with EF &lt; 45%</td>
</tr>
<tr>
<td><strong>Oxygen Therapy</strong></td>
<td>Small randomized studies show improvement in AHI,</td>
</tr>
<tr>
<td></td>
<td>but no improvements in arousals or daytime sleepiness</td>
</tr>
<tr>
<td></td>
<td>Does not have a FDA approved indication to treat CSA</td>
</tr>
<tr>
<td><strong>Medications</strong></td>
<td>Both studied in short (&lt;3 month) studies with &lt; 20 patients</td>
</tr>
<tr>
<td>- Theophylline</td>
<td>Does not have a FDA approved indication to treat CSA</td>
</tr>
<tr>
<td>- Acetazolamide</td>
<td></td>
</tr>
</tbody>
</table>

Transvenous phrenic nerve stimulation Therapy

- **Fully implantable system** with an indication to treat moderate to severe central sleep apnea in adults; received U.S. FDA PMA approval October 2017
- **Stabilizes breathing** by activating the diaphragm to generate negative pressure in the chest (similar to natural breathing)
- **Turns on automatically at night**, ensuring nightly compliance and adherence over time
- Implanted by cardiac electrophysiologists (EPs)
  - **Pulse generator** implanted below clavicle
  - **Stimulation lead** placed either in left pericardiophrenic or right brachiocephalic vein
  - **Sensing lead** placed in the Azygos vein, helps optimize therapy (optional)
Comparison of Normal Inspiration with CSA Therapies

Normal Breathing

Diaphragm pulls air into the lungs

Mask Therapies (ASV, CPAP)

Ventilation pushes air into the lungs via positive intrathoracic pressure

PNS Therapy

pulls air into the lungs using the same mechanism of action as normal breathing

Courtesy William Abraham
Continuous Pulmonary Airway Pressure Support

CPAP – Front Line Treatment for OSA

Great Results When Used Regularly

However...Some patient’s can’t acclimate
Hypoglossal Nerve Stimulation
Sleep Apnea in Patients Post Advanced HF therapies

- Many Advanced HF patients are never been screened, let alone tested prior to being referred for advanced therapies.
- For patients with a history of SBD there is a presumed resolution or marked improvements post left ventricular assist device or transplantation that will not require continuing sleep therapies.
- Significant risks for worsening of sleep apnea resulting in limited response to advanced HF therapies.
- EXTREME PAUSITY OF DATA IN THIS PATIENT POPULATION.
The Effect of Obstructive Sleep Apnea on 3-Year Outcomes in Patients Who Underwent Orthotopic Heart Transplantation

Aasim Afzal, MD, MBA^a,b,*, Kristen M. Tecson, PhD^c, Aayla K. Jamil, MPH^b, Joost Felius, PhD^b, Puncet S. Garcha, MD^c, Shelley A. Hall, MD^c,b, and Sandra A. Carey, PhD^d

Despite the well-known association between obstructive sleep apnea (OSA) and cardiovascular disease, there is a paucity of data regarding OSA in orthotopic heart transplant (OHT) recipients and its effect on clinical outcomes. Hence, we sought to determine the association between OSA, as detected by polysomnography, and late graft dysfunction (LGD) after OHT. In this retrospective review of consecutive OHT recipients from 2012 to 2014 at our center, we examined LGD, i.e., graft failure >1 year after OHT, through competing risks analysis. Due to small sample size and event counts, as well as preliminary testing which revealed statistically similar demographics and outcomes, we pooled patients who had treated OSA with those who had no OSA. Of 146 patients, 29 (20%) had untreated OSA, i.e., OSA without use of continuous positive airway pressure therapy, at the time of transplantation. Patients with untreated OSA were significantly older, heavier, and more likely to have baseline hypertension than those with treated/no OSA. Although there were no differences between groups in regard to short-term complications of acute kidney injury, cardiac allograft vasculopathy, or primary graft dysfunction, there were significant differences in the occurrence of LGD. Those with untreated OSA were at 3 times the risk of developing LGD than those with treated/no OSA (hazard ratio 3.2; 95% confidence interval 1.3 to 7.9; p = 0.01). Because OSA is a common co-morbidity of OHT patients and because patients with untreated OSA have an elevated risk of LGD, screening for and treating OSA should occur during the OHT selection period. © 2019 Elsevier Inc. All rights reserved. (Am J Cardiol 2019;124:51–54)
Thank You!

“I’m the Apnea Fairy. I have orders to give you a wake up call at 10:30, 10:47, 19:53, 11:02, 11:17, 11:26...”