Fall 12-29-2016

Sleep Apnea Equipment's for Obstructive Sleep Apnea

Yogamba Shivakumar
ymshivakumar@usfca.edu

Sleep Apnea Equipment's for Obstructive Sleep Apnea

YOGAMBA MYSORE SHIVAKUMAR
MPH Candidate 2016
University of San Francisco

Abstract

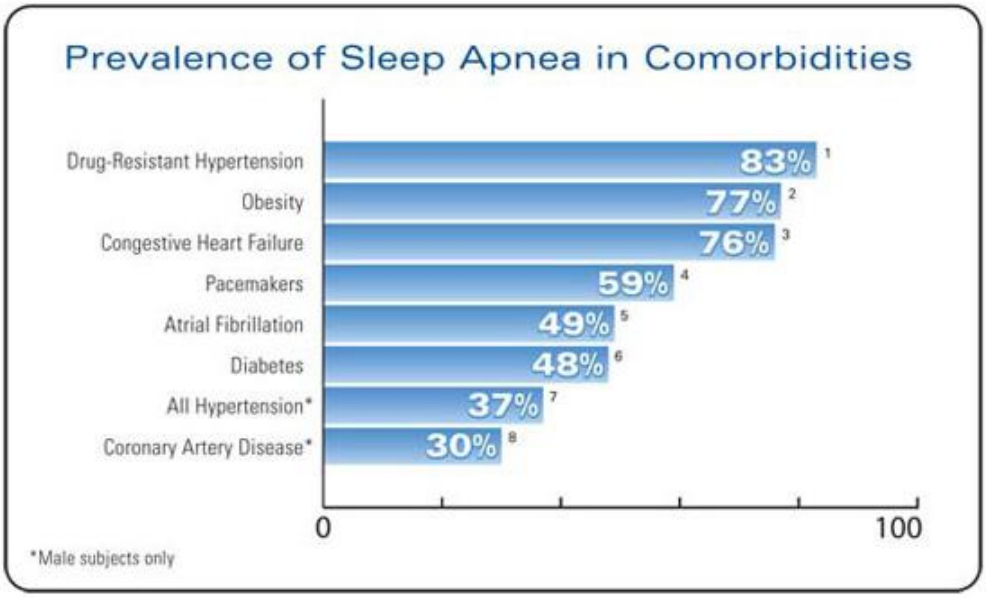
Obstructive Sleep Apnea is a common chronic disorder that is often been ignored and not considered in the society compared to other chronic disorders. The prevalence of Obstructive Sleep Apnea is very much linked to the obesity. Sleep apnea is caused due to recurrent episodes of upper airway obstruction during sleep that is caused by elevations in upper airway collapsibility during sleep. The underlying anatomic alterations and disturbances in upper airway neuromuscular control, plays key roles in the pathogenesis of obstructive sleep apnea. It can increase pharyngeal collapsibility through mechanical effects on pharyngeal soft tissues and lung volume and through central nervous system–acting signaling proteins that may affect airway neuromuscular system. Although weight loss reduces upper airway collapsibility during sleep, it is clearly not proven whether its effects are mediated primarily by improvement in upper airway mechanical properties or neuromuscular control. Middle aged and older people are at higher risk for Obstructive Sleep Apnea because of the increased prevalence factors that are associated with the development of Obstructive Sleep Apnea. A variety of behavioral changes, non-invasive mechanical devices and surgical approaches may be of beneficial to patients with Obstructive sleep apnea.

I. Introduction

Problem: Obstructive Sleep Apnea is highly prevalent and under-recognized chronic disorder, resulting in increasing mortality and morbidity since couple of decades in United States.

As per American Academy of Sleep Medicine, Obstructive Sleep Apnea is destroying the health of millions of Americans and getting worse day by day. Today, it's one of the growing public health problems which need immediate attention. Untreated Obstructive Sleep Apnea can be a high risk factor to other comorbid conditions like Diabetes Mellitus, Stroke, Depression, Hypertension and Heart failure.

Incidence and prevalence of Obstructive Sleep Apnea: According to the National Healthy Sleep Awareness Project at least 25 million adults in the United States are affected with Obstructive Sleep Apnea. Several new studies highlight that it's more prevalent than Asthma and as prevalent as Diabetes. The prevalence of Obstructive Sleep Apnea in the United States is 3% to 7% among males and 2% to 5% among females. Prevalence is higher among adults older than 65 years. But these figures apply only to those with an Obstructive Sleep Apnea diagnosis. An additional 5% of the general population is believed to have undiagnosed Obstructive Sleep Apnea.



As per the data sources published by American Journal of Epidemiology, it shows that the estimated prevalence rates of obstructive sleep apnea have increased substantially over the last two decades and most likely cause is due to the obesity. It is now estimated that 26 percent of adults between the ages of 30 and 70 years have sleep apnea. The fact that prevalence estimates of Obstructive Sleep Apnea from North America, Europe, Australia, and Asia are not substantially different suggests that, Obstructive Sleep Apnea is not only common developed countries but also in developing.

Risk Factors:

Sex: It has been identified that men have greater vulnerability than women towards developing Obstructive Sleep Apnea.

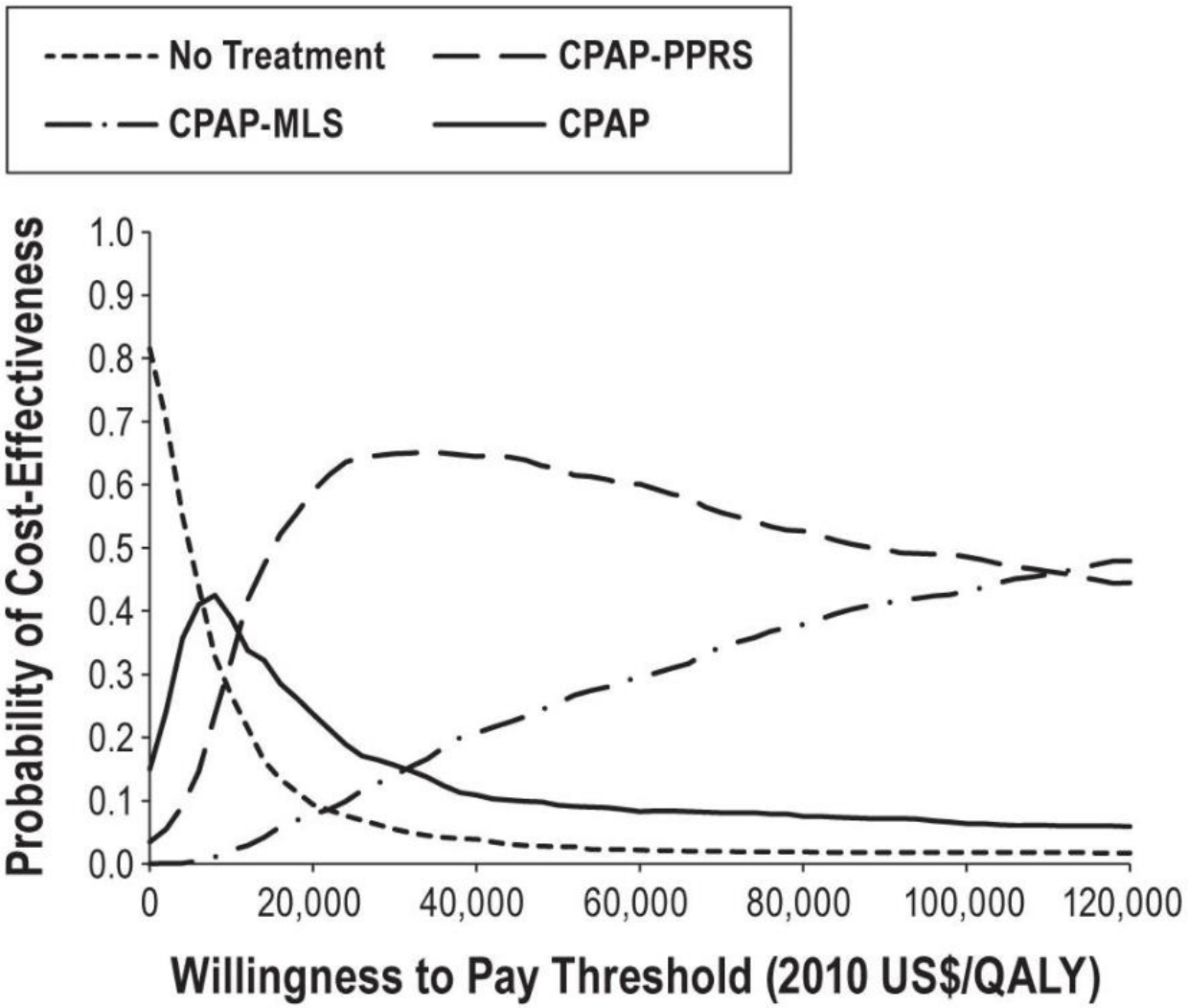
Over weight: People who are obese (Body Mass Index value > 30) have four times the risk of sleep apnea than normal weight people.

Use of alcohol, sedatives or tranquilizers: These substances relax the muscles in throat and thus leading to development of Obstructive Sleep Apnea.

Family History: Studies have proved the strong influence of family history of Obstructive Sleep Apnea will affect their next generations.

Age: Studies from several population-based cohorts confirm the high prevalence of Obstructive Sleep Apnea in older individuals.

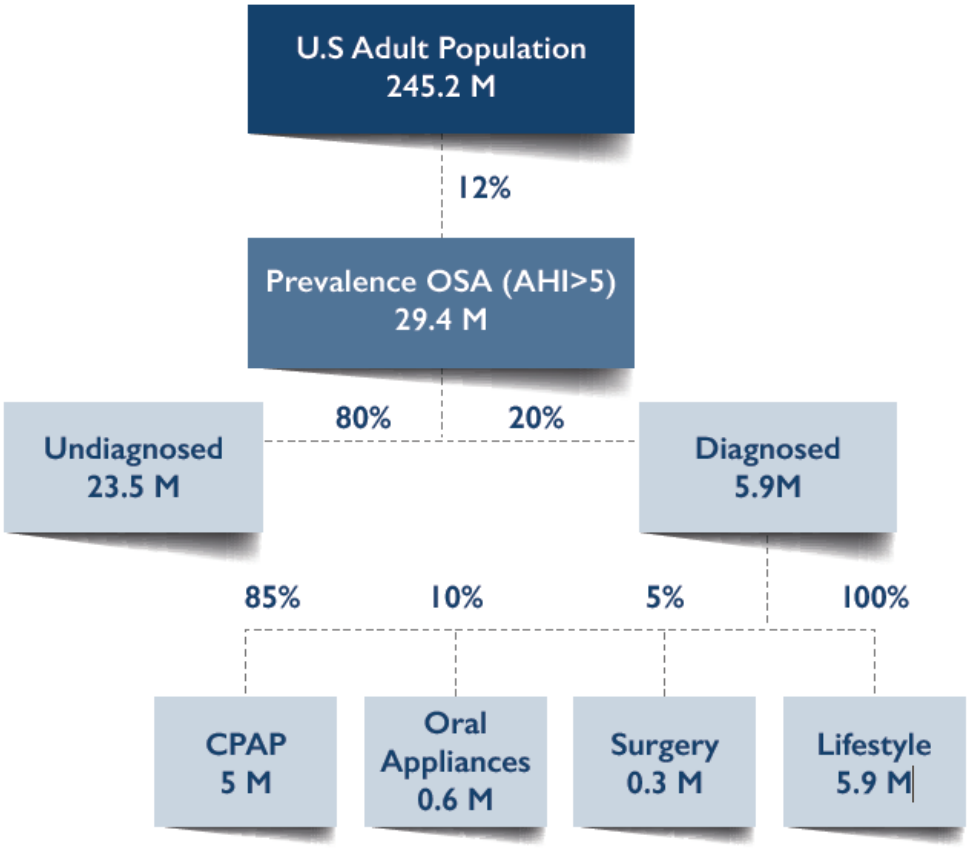
Economic impact of Obstructive Sleep Apnea: As per American Academy of Sleep Medicine (AASM) analysis, diagnosing and treating every patient who has Sleep Apnea in the United States would produce an annual economic savings of $100.1 billion. As per Frost & Sullivan report, the annual economic burden of undiagnosed sleep apnea among adults in United States is approximately $149.6 billion. This includes $86.9 billion in lost productivity, $26.2 billion in auto accidents and $6.5 billion in workplace accidents. Untreated sleep apnea also increases the risk of expensive health complications such as hypertension, heart disease, diabetes and depression.



Societal Consequences of Obstructive Sleep Apnea: As per research conducted at Harvard Medical School, People with Obstructive Sleep Apnea are ten times risker to have a motor vehicle accident because of sleepiness. Obstructive Sleep Apnea related sleepiness can be especially devastating with Commercial truck drivers as well as operators of public transportation vehicles.

II. Background

Wisconsin Sleep Cohort and the Sleep Heart Health Studies estimated that up to 80% of individuals with moderate or severe Obstructive Sleep Apnea had remained undiagnosed by their physicians in spite of having adequate access to health care.



Based on the common symptoms of Sleep Apnea, referral from work places, complaints from bed partners, patients will reach primary care for evaluation and diagnosis. Most of the primary care physicians are unable to conclude it as “Sleep Apnea” due to less exposure and training about its identification techniques.

Screening for Obstructive Sleep Apnea:

Diagnosis begins with a thorough sleep history. Patients are asked about snoring, daytime somnolence, morning headache, gasping or choking episodes at night, sleep fragmentation,

decreased concentration and memory. Different diagnostic tools such as Overnight pulse oximetry, Polysomnography and Home sleep testing (HST) are used based on the cost and accuracy.

Treatment options:

The first step is behavioral or lifestyle modifications such as losing weight, avoiding alcohol, sleep aids and quitting smoking. Weight loss in overweight patients has proven effective to decrease apnea symptoms.

For moderate to severe sleep apnea, the use of a continuous positive airway pressure **(CPAP)** is the most effective treatment option. It has been proven to improve sleep architecture there by reducing apneic episodes, neurobehavioral performance and cardiovascular morbidity (hypertension).

For Mild to moderate Obstructive Sleep Apnea, dental appliances treatment can be successful but has been proven to be less effective for severe cases.

Another option is Surgery; studies have not been conclusive that surgery has been effective at treating severe Obstructive Sleep Apnea.

CPAP (continuous positive airway pressure) seems to be more effective and proven method for Obstructive Sleep Apnea. Majority of research studies correlate it.

Major Obstacles or Barriers to Obstructive Sleep Apnea Diagnosis and Treatment:

General Public Awareness: Many individuals do not recognize symptoms and severity of the condition. There is less awareness and knowledge within the community compared to other chronic health conditions like Diabetes, Hypertension and Asthma.

Primary Care Physician Education: Health care providers and caregivers do not routinely ask about duration and quality of sleep or screen patients for Obstructive Sleep Apnea.

Diagnosis and Treatment Costs: It is usually covered by payers for qualified patients, costs average $2,105 per year for testing, appointments, treatment devices and surgery.

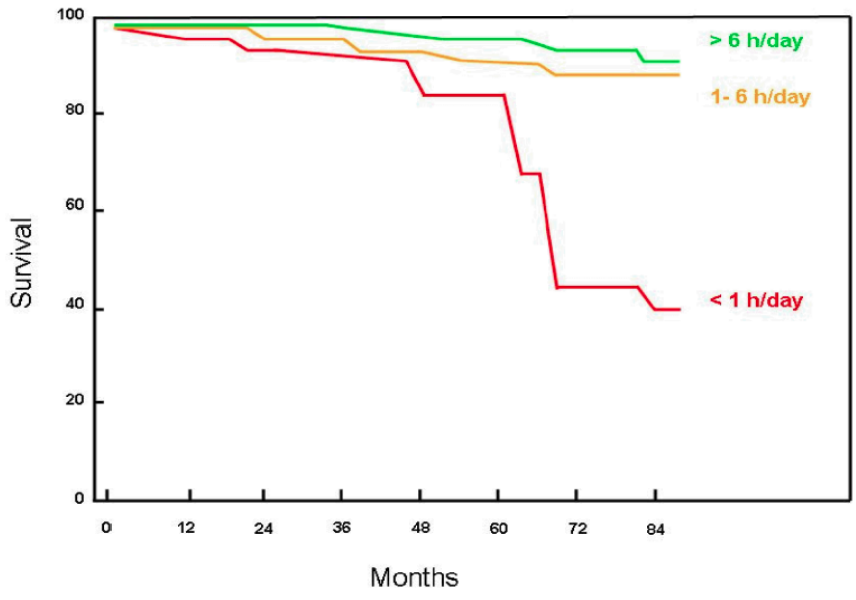
Employer and Payer Investment for Chronic Care Management: Economic stakeholders are still developing process for cost models that is financially feasible for managing chronic conditions in order to lessen longer-term risk for acute events.

As per Center for Disease Control study conducted, Table below shows improved results using CPAP (continuous positive airway pressure) therapy.

Table 3. Adherence of Patients With Obstructive Sleep Apnea (n = 368) Treated With Positive Airway Pressure and Response in Patients with Good Adherence to Treatment (n = 172), Cincinnati Veterans Affairs Medical Center, 2005-2007

Adherence/Response	Obstructive Sleep Apnea Severity,[a] n %			*P* Value[b]
	Mild (n = 103)	Moderate (n = 77)	Severe (n = 188)	
Adherence[c]				
Good	40 (39)	32 (42)	100 (53)	.09
Partial	20 (19)	12 (16)	21 (11)	
Not adherent	18 (17)	12 (16)	36 (19)	
Not specified/no data	25 (24)	21 (27)	31 (16)	
Response[d]				
Excellent	0	4 (12)	27 (27)	.01[e]
Moderate	25 (62)	17 (53)	49 (49)	
No change	1 (2)	0	2 (2)	
Not specified/no data	14 (35)	11 (34)	22 (22)	

Based on Kaplan-Meier cumulative survival curve according to long-term CPAP (continuous positive airway pressure) adherence in patients with Obstructive Sleep Apnea emphasizing the relationship between average daily adherence with CPAP (continuous positive airway pressure) therapy and mortality. Cumulative survival rates in the CPAP > 6-h group and in the CPAP 1–6 h group were significantly higher than the CPAP < 1 h group.



III. Scope of the Project

Sleep apnea is a serious breathing disorder that affects millions of Americans today. Breath California of bay area is located at San Jose, California. It serves Santa Clara, San Benito, Alameda, Fresno, Madera and Merced counties. It is a Not-for profit organization. Breath California of bay area runs a unique program about “Obstructive Sleep Apnea and CPAP (continuous positive airway pressure) device”- creating awareness, educating patients and distribution of equipment’s. In certain cases, equipment prescribed by the physician to treat sleep apnea is not covered by insurance. Breathe California of the Bay Area conducts this popular program in which they accept donated CPAP (continuous positive airway pressure) and BiPAP (bi-level positive airway pressure) machines and redistribute them on a first-come, first-served basis. Breath California of bay area provides CPAP/ Auto CPAP, Bi-PAP /Auto Bi-PAP machines and respiratory equipment to the uninsured and under covered OSA patients.

The purpose of the project is to:

- Provide Sleep Apnea Equipment's for Obstructive Sleep Apnea Patients.
- Educate and Share knowledge regarding benefits of Sleep Apnea Equipment's.
- Screen the community members for Obstructive Sleep Apnea and lung diseases.
- Working with hospitals and sleep clinics to encourage donations of equipment’s.
- Community outreach programs for Sleep Apnea and its treatment.

Goal:

- Provision of sleep apnea equipment’s for patients suffering from moderate to severe Obstructive Sleep Apnea.
- Educate and Share knowledge regarding “Sleep related disorders” within the community.
- Providing Screening opportunity for bay area community members for early prevention of lung diseases.

Objective:

- To maximize the number of Obstructive Sleep Apnea equipment recipient's list every quarter.

Activities:

CPAP (continuous positive airway pressure) project team comprises of BCBA (Breathe California of bay area) employees – CPAP program co-coordinator, Community outreach co-coordinator, respiratory therapist, marketing intern and three public health interns.

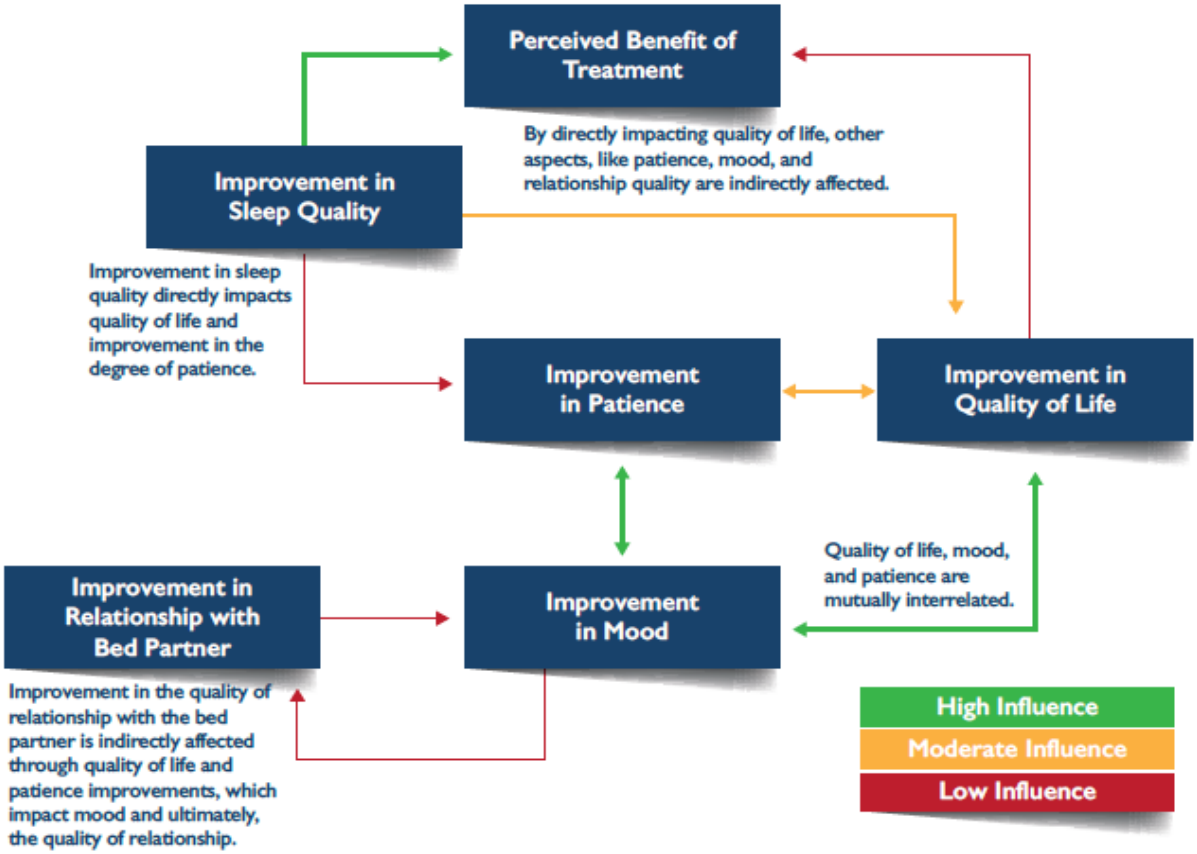
BCBA (Breathe California of bay area) is constantly involved in acquiring the equipment's via donations from neighboring hospitals, sleep clinics and individuals donors. Marketing team is working successfully in creating awareness via campaigns, camps, social media postings and conducting community health fair events. CPAP (continuous positive airway pressure) coordinators will organize and co-ordinate meetings with Physicians in order to update current epidemiological data and treatment modalities on Obstructive Sleep Apnea for the benefit of community. Under respiratory therapist guidance, incoming equipment's are tested for the validity and functionality in order to organize the equipment's for the delivery. All received equipment's inventory list is maintained in the database for tracking purposes. This helps to keep track of avoiding unnecessary or duplicated deliveries.

BCBA (Breathe California of bay area) schedules activities and projects related to sleep disorders and lung health issues. It is also involved in improving the awareness and knowledge among the community members by distributing educative materials, electronic newsletter. They also provide demo classes and presentations on sleep disorders organized at senior centers and at work places.

BCBA (Breathe California of bay area) provides great opportunities for workers and community members to get screened for sleep disorders in their organizations, also prompts physician consultation based on screening reports. This has served a greatest attempt in early prevention of sleep disorders. Participants will have one to one conversation with BCBA representatives to discuss the sleep disorders and lung health issues.

IV. Public/Population Health Impact: Findings and Significance

CPAP treated patients gained the following benefits throughout the project and have made an impact in improving the public health issue. It has resulted in Improvement in Sleep Quality, Improved Patience, improvement in Quality of Life, Improvement in Mood, Improved Relationship with Bed Partner and decrease in medical expenses.



The next steps that can be considered to bring a positive impact over Sleep Apnea:

Improve Awareness programs related to sleep disorders: The lack of awareness among the general public about Sleep Apnea will not trigger the patients to openly discuss sleep problems with their health care providers.

Minimize Stigma and fear: In addition to Stigma, fear is being labeled as having a psychiatric problem. These are the contributing for undiagnosed cases of OSA.

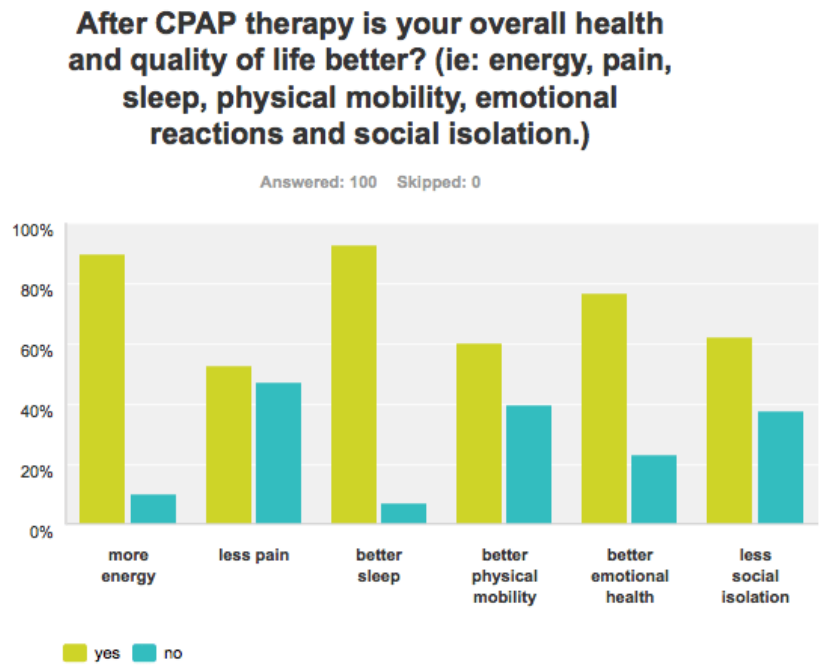
Improve Sleep education programs at Hospital and clinic settings: As per review of the National Center on Sleep Disorders Research (NCSDR) and Centers for Disease Control and Prevention (CDC) demonstrate that, little investment in education and awareness campaigns directed toward increasing the general public's knowledge of the health implications associated with chronic sleep loss and sleep disorders will bring effective change.

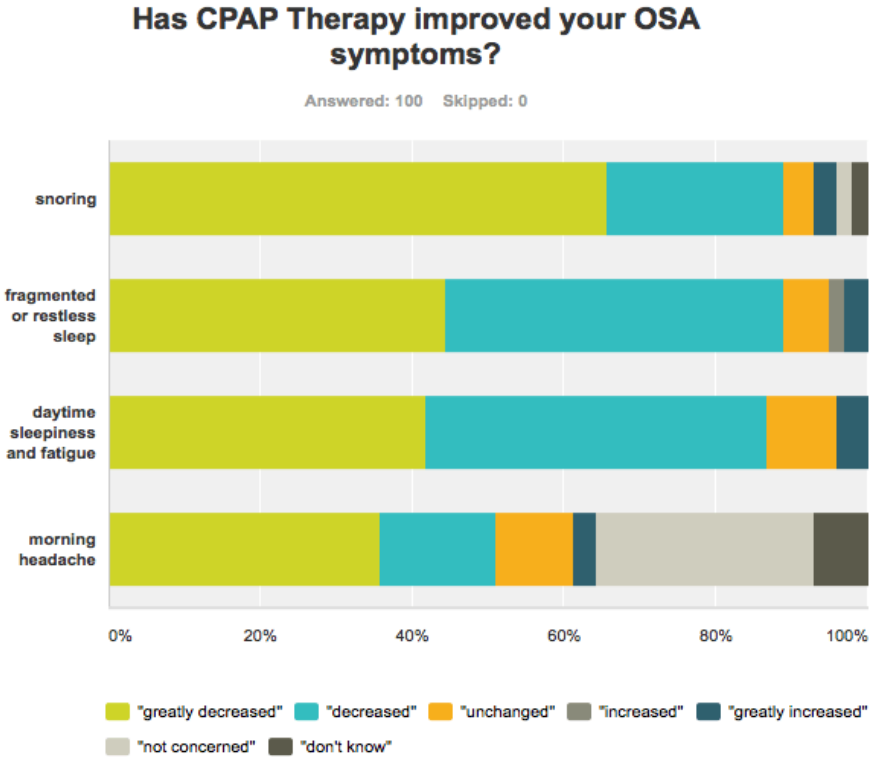
Training curriculum for Health care providers: On a periodic basis, training needs to implemented at health care facilities.

From an organizational perspective, **Breathe California of Bay Area** needs more funding to extend the strategic plan for CPAP program. The program also needs more recognition, so that the community outreach can be to larger extent. Based on my experience, working as an intern at **Breathe California of Bay Area,** the organization needs more Respiratory equipment's donations omitting the present sources. It will be fruitful to work collaboratively with corporate hospitals and medical equipment companies.

Most of the Bay area residents are unaware of the fact that, they can drop-off the used Respiratory equipment's to nearby sources working towards re-distributing equipment's. Since Breathe California of Bay Area CPAP project is relatively unknown, the organization should tie up with Public Relation Agency to bring visibility in the community. These efforts can serve the community and save lives of Obstructive Sleep Apnea patients who are in need of continuous positive airway pressure (CPAP).

Below are the results based on the survey conducted among CPAP therapy patients.





V. Conclusion

Obstructive Sleep Apnea is a public health hazard and primarily affects overweight adults. It not only causes snoring while asleep but also repeated obstruction, interrupts the normal breathing pattern. This in turn leads to a drop in oxygen saturation within the blood which can damage organs such as the heart and the brain. The condition or symptoms leading to Obstructive Sleep Apnea should not be ignored. It can be diagnosed by a visit to the sleep lab, which conducts series of tests and determines the levels (mild, moderate, severe) of Obstructive Sleep Apnea. Simple advice such as change in their behavioral pattern can treat patients with mild sleep apnea. A more advanced condition may require using equipment like continuous positive airway pressure (CPAP). Regular follow up is needed with a sleep specialist who will monitor whether the treatment is working and also any possible side effects related to the treatment. Continuous positive airway pressure (CPAP) treated patients reported good adherence to treatment with positive airway pressure and response to treatment correlated with Obstructive Sleep Apnea.

During the next decade, the health care community will continue to face a variety of medical conditions associated with obesity particularly an increasing global prevalence of Obstructive Sleep Apnea. With such a high prevalence rate of Obstructive Sleep Apnea in the general population, further research is needed with various diagnostic strategies such polysomnography and portable home monitoring.

References

Samson, P., & Casey, K. (2012). Clinical Characteristics, Comorbidities, and Response to Treatment of Veterans With Obstructive Sleep Apnea, Cincinnati Veterans Affairs Medical Center, 2005-2007. Retrieved December 01, 2016, from http://www.cdc.gov/pcd/issues/2012/11_0117.htm

Sleep Apnea. (n.d.). Retrieved December 01, 2016, from https://sleepfoundation.org/sleep-disorders-problems/sleep-apnea

Punjabi, N. M. (2008). The Epidemiology of Adult Obstructive Sleep Apnea. Retrieved December 01, 2016, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2645248/

A, T., & H, R. (n.d.). The economic impact of obstructive sleep apnea. Retrieved December 01, 2016, from https://www.ncbi.nlm.nih.gov/pubmed/24060978

Rubens, S., Patrick, K., & Moore, M. (n.d.). Individual and socio-demographic factors related to presenting problem and diagnostic impressions at a pediatric sleep clinic. Retrieved December 01, 2016, from https://www.ncbi.nlm.nih.gov/pubmed/27823719

Continuous Positive Airway Pressure (CPAP). (2015). Retrieved December 01, 2016, from http://www.entnet.org/content/continuous-positive-airway-pressure-cpap

Young, T., & Peppard, P. (n.d.). American Journal of Respiratory and Critical Care Medicine. Retrieved December 01, 2016, from http://www.atsjournals.org/doi/full/10.1164/rccm.2109080

Sleep Apnea Facts and Figures. Retrieved December 1, 2016, from http://www.resmed.com/us/dam/documents/products/dental/Narval-CC/facts-and-figures/1015527r3_narval-cc-mrd_facts-and-figures_amer_eng.pdf

Peppard, P. E., Young, T., Barnet, J. H., Palta, M., Hagen, E. W., Hla, K. M., & ppeppard (2013). Increased prevalence of sleep-disordered breathing in adults. *American Journal of Epidemiology*. doi:10.1093/aje/kws342

CPAP health benefits and health risk prevention. (2016). Retrieved December 1, 2016, from http://www.sleepeducation.org/essentials-in-sleep/cpap/benefits