Obstructive Sleep Apnea Care Guide

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CALIFORNIA CORRECTIONAL HEALTH CARE SERVICES

Information contained in the Care Guide is not a substitute for a health care professional's clinical judgment. Evaluation and treatment should be tailored to the individual patient and the clinical circumstances. Furthermore, using this information will not guarantee a specific outcome for each patient. Refer to "Disclaimer Regarding Care Guides" for further clarification.

https://cchcs.ca.gov/clinical-resources/

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GOALS

Manage Obstructive Sleep Apnea (OSA) to mitigate comorbid complications. i.e., hypertension, heart disease, stroke.

- ✓ Resolve signs and symptoms of OSA
- ✓ Improve quality of life
- ✓ Normalize the Apnea-Hypopnea Index (AHI) and oxyhemoglobin saturation levels

ALERTS

- Women are at risk for under-diagnosis; history should emphasize accompanying symptoms. (See page 5)
- Craniofacial or upper airway injuries or abnormalities increase the likelihood of having OSA.

Background of Obstructive Sleep Apnea

Definition

Obstructive sleep apnea (OSA) is a breathing disorder occurring during sleep when narrowing of the upper airway impairs normal ventilation.

There are four major groups of sleep-related breathing disorders, according to the International Classification of Sleep Disorders (ICSD-3)[11]:

- **Central sleep apnea syndromes:** (CSA) is a disorder characterized by repetitive cessation or decrease of both airflow and ventilatory effort during sleep.
  - CSA is less common than OSA
  - CSA is often associated with other medical conditions, especially heart failure, stroke, and opioid medications. Rare cases are primary or idiopathic.
- **Obstructive sleep apnea disorder:** characterized by repetitive collapse of the upper airway during sleep which results in apnea, hypopnea, and/or respiratory effort related arousals.
  Obstructive **apneas** are defined as near complete (>90%) cessations in airflow for longer than 10 seconds in sleep, despite ventilatory effort. **Hypopnea** is generally defined as a decrease in airflow by more than 30% with simultaneous reductions in oxyhemoglobin saturation by at least 3% from baseline or arousals from sleep [22].
- **Sleep-related hypoventilation disorders: refers to hypoventilation that worsens or exclusively during sleep, including** obesity hypoventilation syndrome, sleep-related hypoventilation due to a medication, substance, or a medical disorder, etc.
- **Sleep-related hypoxemia disorder:** such as sleep-disordered breathing (nocturnal hypoxemia) in patients with chronic obstructive pulmonary disease (COPD).

OSA is the most common sleep-related breathing disorder and OSA in adults will be the focus of this guideline.

OSA is defined as ≥5 apneic, hypoxic, or sleep arousal events per hour despite efforts to breathe. The American Academy of Sleep Medicine (AASM) uses the Apnea-hypopnea Index (AHI) (The combined average number of apneas and hypopneas that occur per hour of sleep) to define the severity of OSA as mild, moderate, or severe. (See pages 9 and 10)

Background of OSA, cont'd

In individuals with untreated OSA, repeated pauses in breathing lead to fragmented sleep, episodes of lower-than-normal oxygen levels (hypoxemia) and a buildup of carbon dioxide (hypercapnia) in the bloodstream, swings in intrathoracic pressure, and increased sympathetic nervous activity. They often feel unrested, fatigued, and sleepy during the daytime. Their cognitive function, concentration, memory, mood, social interaction, and quality of life (QOL) can be negatively impacted. OSA is associated with higher rates of unintentional injury, including motor-vehicle collisions and work-related injuries.

Furthermore, OSA is associated with increased morbidity and mortality rates, higher risk of developing insulin resistance, type 2 diabetes, metabolic syndrome, hypertension, heart disease, and stroke.[7]

Epidemiology

OSA is most common among older men, but it can also affect women (incidence rises after menopause) and children.

The estimated prevalence in North America is approximately:

- 15-30% in men and 10-15% in women, when OSA is defined broadly as an AHI > 5 events/hr. of sleep.
- 15% in men and 5% in women, when more stringent OSA definition of AHI ≥5 events/hr. plus symptoms or AHI ≥15 events/hr is used.

The prevalence of OSA varies by race. OSA is more prevalent in African Americans who are younger than 35 years old compared with White Americans of the same age group, independent of body weight. The prevalence appears to be increasing and may relate to the increasing rates of obesity or increased detection rates of OSA.

Risk factors

All patients established risk factors:

- Older age- 40-70 years
- Male gender- 2-3X more common in men. In women risk equalizes once they are peri and postmenopausal.
- Obesity
- Craniofacial and upper airway abnormalities

All patients less well-established risk factors:

- Smoking
- Family history of Snoring/OSA
- Others – Nasal congestion confers an approximately two-fold increase in the prevalence of OSA compared with controls, regardless of the cause. However, OSA may or may not improve with correction of nasal congestion. Exposure to high levels of environmental nitrogen dioxide and particulate matter may contribute to variations in OSA among patient populations.

Risk Factors Specific to Women:

- Menopause
- Polycystic ovary syndrome (PCOS)
- Pregnancy
  - OSA risk increases during pregnancy but may resolve after birth of the child.
- Menstrual cycle
  - Fluctuating hormone levels during menstruation may cause OSA symptoms to become more severe.

Risk Factors, cont'd

The Prevalence of OSA is also increased in patients with a variety of medical conditions, including the following:

- Obesity hypoventilation syndrome
- Systemic hypertension (particularly resistant hypertension)
- Congestive heart failure
- Cerebrovascular disease (e.g., Stroke, transient ischemic attacks)
- Atrial fibrillation
- Coronary artery disease
- Chronic lung disease (asthma, chronic obstructive pulmonary disease, and idiopathic pulmonary fibrosis)
- Pulmonary hypertension
- End-stage kidney disease
- Hypothyroidism

While testosterone increases sleep apnea risk, estrogen and progesterone are known to reduce sleep apnea risk. It has been noted that OSA was likely underdiagnosed in women, which may be because women are less likely to report snoring, and their symptoms are different than men.[11] The risk of sleep apnea in transgender patients may be altered depending on the use of supplemental hormones and surgical status.[12]

Screening

The United States Preventive Services Task Force (USPSTF) states there is insufficient evidence to recommend for or against screening for OSA in the general adult population. The USPSTF calls for more research on the benefits and harms of screening for OSA, as well as screening tools that can accurately detect persons in the general adult population at increased risk of OSA. Thus, USPSTF recommends providers should use their clinical judgment regarding whether to screen and how to screen for OSA.

Diagnosis of Obstructive Sleep Apnea

Many signs and symptoms, along with risk factors, can suggest OSA, as indicated below.

Clinical History

Predictive clinical features of OSA include loud snoring and witnessed gasping during sleep, morning headaches, excessive daytime sleepiness (EDS), and neck circumference of > 17 inches in men and > 16 inches in women.[4]

EDS is defined, according to the ICSD-3, as the inability to maintain wakefulness and alertness during the major waking episodes of the day, with sleep occurring unintentionally or at inappropriate times almost daily for at least three months.[17] The Epworth Sleepiness Scale (ESS) is a self-reported questionnaire assessing the patient's propensity for daytime sleepiness or dozing in eight sedentary situations. A score greater than 10 is considered abnormal and supportive of EDS. The ESS can also be found in the ad hoc section in the EHRS.

Other symptoms can include:

- Nonrestorative sleep
- Fatigue
- Nocturnal restlessness
- Sleep maintenance insomnia
- Poor concentration and memory
- Mood changes
- Nocturia
- Postoperative hypoxemia
- Nocturnal cardiovascular events, or palpitations due to atrial fibrillation.

Women may report different, less typical symptoms than men, such as:

- Feeling depressed
- Having trouble sleeping,
- Having nocturia
- Restless legs.[10]

Physical Examination

Besides history, physical and lab parameters such as blood pressure, BMI, oxygen saturation and serum bicarbonate can offer important clues on the next steps of evaluation.

Diagnosis of OSA, cont'd

Common physical findings are the following:

- **Obesity** – despite obesity (BMI ≥ 30 kg/m2) being the most common clinical finding in patients with OSA, some patients may be overweight (BMI 25 to 29.9 kg/m2), or their weight may be within the normal range.
- **Crowded oropharyngeal airway** – Numerous craniofacial conditions can narrow the upper airway and contribute to the development of OSA. These include retrognathia, micrognathia, lateral peritonsillar narrowing, macroglossia, tonsillar hypertrophy, an elongated or enlarged uvula, a high arched or narrow palate, nasal septal deviation, and nasal polyps.
- **Large neck and/or waist circumference** – OSA is more strongly correlated with an increased neck size or waist circumference than general obesity. OSA is particularly prominent among:
  - Men who have a collar size > 17 inches
  - Women who have a neck size > 16 inches
- **Mallampati score** – May be an independent predictor of both the presence and severity of obstructive sleep apnea. It was suggested that an increase in the Mallampati score correlates with the odds of having obstructive sleep apnea (apnea-hypopnea index > or = 5) and the apnea-hypopnea index. [20] However, this has not been confirmed by other studies and the variable technique among individual examiners may be a challenge for its practical use in predicting the severity of OSA [21,22].
- **Signs of associated conditions and complications** – Patients with OSA may also have the signs of associated conditions and complications, most commonly systemic hypertension and heart failure, and less commonly pulmonary hypertension.

Diagnostic evaluation

While OSA should be suspected whenever a patient presents with EDS, snoring, and choking or gasping during sleep particularly in the presence of risk factors such as obesity, male sex, and advanced age, it is not a clinical diagnosis and objective testing must be performed for the diagnosis.

Who To Screen:

In general, diagnostic testing for OSA should be performed on patients with EDS on most days and the presence of at least two of the following clinical features of OSA [19]:

- Habitual loud snoring
- Witnessed apnea or gasping or choking during sleep
- Diagnosed systemic hypertension

These features correlate with moderate to high risks of OSA, who will most likely benefit from therapy. Alternatively, there are pretest prediction models developed to predict the probability of OSA, with STOP-Bang (**S**nore, **T**ired, **O**bserved apnea, blood **P**ressure, **B**MI, **A**ge, **N**eck, **G**ender) being one such example. A score of 3 or higher on this survey indicates a high probability of OSA. STOP-BANG Score for Obstructive Sleep Apnea (mdcalc.com)

In the absence of these criteria, some experts also recommend diagnostic testing in the following:

- EDS alone
- Patients who have other clinical features of OSA (e.g., obesity, fatigue, upper airway abnormalities, snoring) and conditions or complications associated with OSA (e.g., refractory hypertension, atrial fibrillation, nocturnal angina or dysrhythmias, congestive heart failure, stroke, and transient ischemic attacks).
- Patients in whom OSA needs to be ruled in or out as an underlying cause or potential contributing factor to their symptoms (e.g., unexplained pulmonary hypertension or polycythemia, or accident due to falling asleep).

Diagnosis of OSA, cont'd

How To Screen:

Traditionally, obtaining objective evidence of OSA was achieved by testing in a sleep lab setting with polysomnography (PSG). More recently, unattended home sleep apnea testing (HSAT) has been made available and is useful in select groups of patients. HSAT is the preferred sleep study in CCHCS, unless there are contraindications which would require in-lab PSG. (Refer to Algorithm 1 for those conditions requiring PSG.)

HOME SLEEP APNEA TESTING (HSAT)

HSAT devices monitor various physiological signals but do not directly assess sleep because they do not include channels for electroencephalography (EEG), electro-oculography (EOG), and surface electromyography (EMG).

- The following signals are typically recorded during HSAT:
  - Type 3 monitoring devices (portable HSAT devices) typically measure between four and seven physiologic variables, including:
    1. Two respiratory variables (e.g., respiratory effort and airflow)
    2. Cardiac variable (e.g., heart rate or an electrocardiogram)
    3. Arterial oxyhemoglobin saturation via pulse oximetry
    4. Some devices have additional signals that can detect snoring, determine body position, or detect movement

Health Equity Note:

See CCHCS Focus on Health Equity: Pulse Oximeters and Skin Pigmentation

Pulse Oximeters and Skin Pigmentation HE Alert.pdf

Within CCHCS, the "WatchPAT" is being used for HSAT.[12, 13] The WatchPAT device uses peripheral arterial tonometry (PAT) to measure the pulsatile arterial waveform associated with cardiac contraction. It also measures oximetry, heart rate, snoring, actigraphy, and body position.[4] Respiratory events are recorded in a watch-sized computer worn on the wrist, as reflected by the episodes of oxyhemoglobin desaturation, heart rate acceleration, and dampening of arterial pulsation amplitude.

HSAT measures the respiratory-event index (REI), see Table 1 for definitions and diagnostic criteria using HSAT.

Note that WatchPAT can use the integrated data to detect sleep and wake states and thus calculate pAHI and pRDI.

Importantly, should a single HSAT be negative, inconclusive, or technically inadequate, and the suspicion remains for OSA, HSAT should **not** be repeated. Rather, it is strongly recommended that an in-laboratory study be performed.

POLYSOMNOGRAPHY[17]

- Patients with the following conditions should have PSG because they are at higher risk for non-obstructive sleep disordered breathing. (Also listed in Algorithm 1):
  - Significant cardiopulmonary disease (GOLD stage 2, 3, 4 chronic obstructive pulmonary disease, NYHA class III or IV heart failure)
  - Respiratory muscle weakness due to neuromuscular condition
  - Awake hypoventilation or high risk of sleep related hypoventilation
  - History of stroke
  - Chronic opioid medication use*
  - Suspected to have non OSA sleep disorders (e.g., narcolepsy, severe insomnia, parasomnias, sleep-related movement disorders)

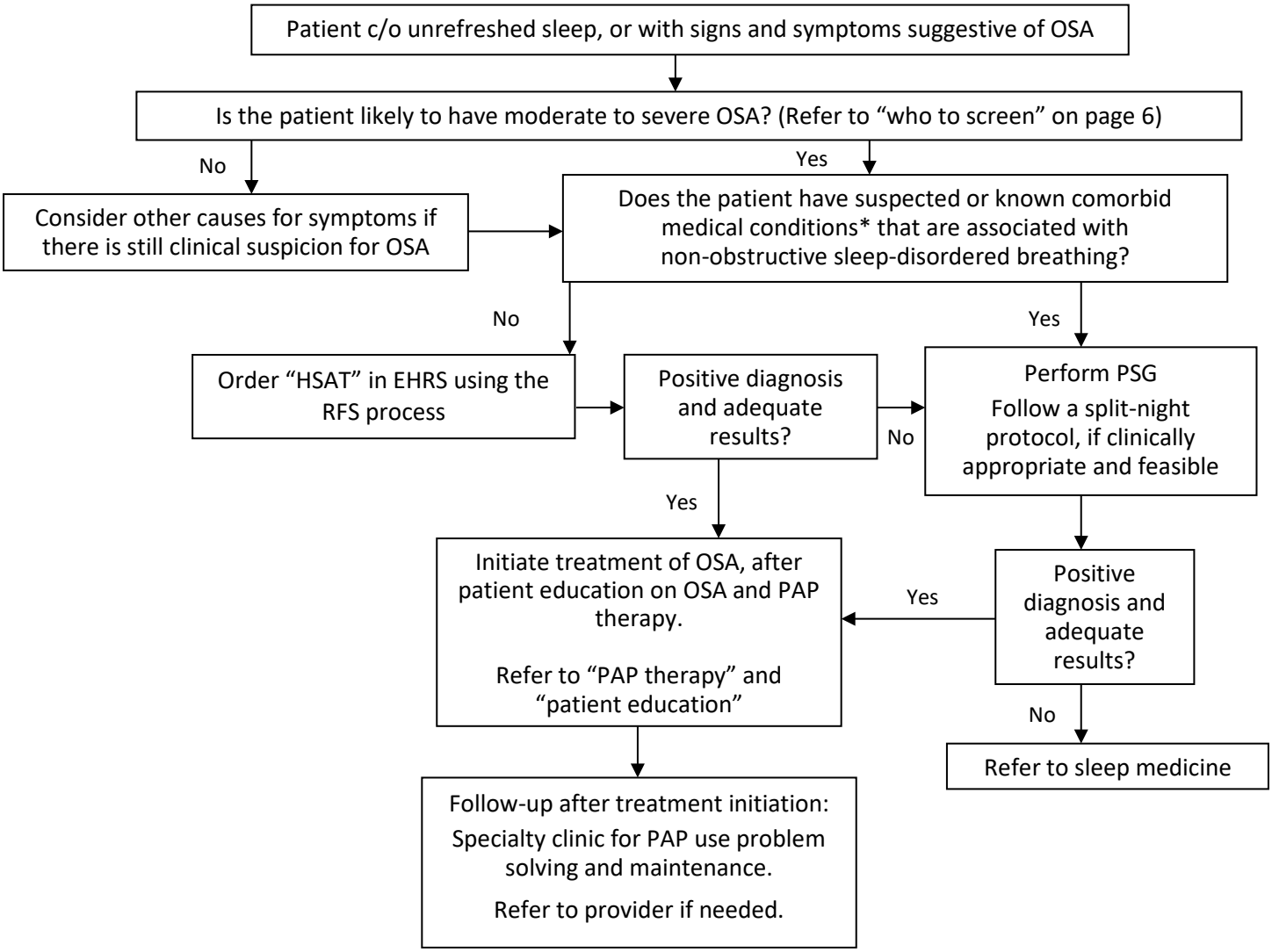
* Medications[23] other than opioids can also significantly increase the risk of respiratory depression by affecting the central nervous system such as benzodiazepines (e.g., diazepam, oxazepam), antipsychotics (e.g., quetiapine), anticonvulsants (e.g., gabapentin, pregabalin), antidepressants (e.g., mirtazapine) either when used alone or combined with opioids. In carceral setting, gabapentinoids[24] and mirtazapine[25,26] are particularly abused and associated with significantly increased opioid related mortality.

Diagnosis of OSA, cont'd

- The following signals are recorded during PSG:
  - **Sleep staging** - EEG, EOG, and EMG are required to stage sleep and identify arousals.
  - **Respiratory airflow** - oral and nasal pressure and airflow
  - **Respiratory effort** - which is typically measured by using a combination of thoracic and abdominal respiratory inductance plethysmography (RIP).
  - **Pulse oximetry** - a standard component of PSG, allowing for continuous monitoring of arterial oxyhemoglobin saturation (SpO2).
  - **Cardiac rhythm** - which is also routinely performed by electrocardiographic monitoring.
- In lab PSG can be done as:
  - **Split-night testing**: This protocol should be followed if clinically appropriate and feasible. In this protocol, the first half of the sleep session is spent in diagnosis and if OSA is diagnosed, and meet certain criteria (Such as moderate to severe OSA is observed during a minimum of 2 hours of recording time on the diagnostic PSG and at least 3 hours are available to complete continuous positive airway pressure, CPAP titration) [20], then the rest of the night is spent titrating positive airway pressure (PAP) therapy.
  - **Full-night testing**: When the criteria for split-night protocol is not met, the patient is monitored for a full sleep period. If OSA is diagnosed and PAP therapy is desired, the patient returns for another sleep session to have PAP titrated.

    (See Table 1 on page 10 for definitions and diagnostic criteria using PSG.)

ALGORITHM 1: DIAGNOSTIC APPROACH AND INITIAL MANAGEMENT OF OSA



*These conditions include:

- Significant cardiopulmonary disease (GOLD stage 2, 3, 4 chronic obstructive pulmonary disease, NYHA class III or IV heart failure)
- Respiratory muscle weakness due to neuromuscular condition
- Awake hypoventilation or high risk of sleep related hypoventilation
- History of stroke
- Chronic opioid medication use†
- Suspected to have non OSA sleep disorders (e.g., narcolepsy, severe insomnia, parasomnias, sleep-related movement disorders)

OSA: obstructive sleep apnea

HSAT: home sleep apnea testing

PSG: polysomnography

PAT: peripheral arterial tonometry

PAP: positive airway pressure

EHRS: electronic health record system

† Note that other medications, combined with opioids or used alone, can cause significant respiratory depression. See page 7 for details.

Adapted and revised from Figure 2 in Kapur VK, et al. "Clinical Practice Guideline for Diagnostic Testing for Adult Obstructive Sleep Apnea: an American Academy of Sleep Medicine clinical practice guideline." J. Clin Sleep Med. 2017;13 (3): 479-504.

Diagnosis of OSA, cont'd

Table 1. Diagnostic Scoring Of Obstructive Sleep Apnea

Sleep Testing Device	Index	Diagnostic Criteria for OSA
Polysomnography*	AHI	AHI 5 to 14/hour sleep PLUS one or more sleep associated conditions¶ or AHI >15/hour sleep
	RDI	RDI 5 to 14/hour sleep PLUS one of more sleep associated conditions¶ or RDI ≥15/hour sleep
Home Sleep Apnea Device	REI	REI ≥15/hour total recording time or REI 5 to 14 and sleep associated conditions¶

For the diagnosis of OSA, respiratory events should be identified as primarily obstructive (i.e., apneas, hypopneas, arousals that are associated with respiratory effort). These events are used to generate the following indices:

- AHI: apnea-hypopnea index (apneas + hypopneas / total sleep time in hours)
- RDI: respiratory disturbance index (apneas + hypopneas + respiratory effort-related arousals [RERAs] / total sleep time in hours)
- REI: respiratory event index (apneas + hypopneas / total recording time)

* Most polysomnography studies will report AHI, RDI, or both values. the clinician should recognize that the RDI may overestimate, or the AHI underestimate the number of respiratory events during sleep. However, no consensus has been reached regarding which value is more accurate.

¶Sleep-associated conditions include the following:
- Sleepiness, nonrestorative sleep, fatigue, or insomnia symptoms
- Waking up with breath holding, gasping, or choking
- Habitual snoring, breathing interruptions, or both noted by a bed partner or other observer
- Hypertension, mood disorder, cognitive dysfunction, coronary artery disease, stroke, congestive heart failure, atrial fibrillation, or type 2 diabetes mellitus

Classification of severity — Patients who meet criteria for a diagnosis of OSA are traditionally classified as having mild, moderate, or severe disease based on the AHI and symptoms. With increasing use of HSAT, similar stratification is being used for REI. The definitions can be somewhat arbitrary, and the literature often interchanges AHI for RDI.[6]

The following is a general description of patients in each category.

Mild – patients with an AHI/RDI/REI between 5-14 respiratory events/hour of sleep.
- Such patients may be relatively asymptomatic or report sedentary (i.e., passive) daytime sleepiness, becoming noticeable once the patient is unstimulated. The daytime sleepiness often does not impair daily life, although it may be recognized by family members.

Moderate – patients with an AHI/RDI/REI between 15-30 respiratory events/hour of sleep.
- Such patients are typically aware of daytime sleepiness and take steps to avoid falling asleep at inappropriate times (e.g., taking a nap or avoiding driving long distances). They can continue their daily activities, but at reduced levels, and they may have an increased incidence of motor vehicle violations or accidents.
- Systemic hypertension may coexist. Sleep fragmentation is observed in moderate OSA, but sleep architecture (i.e., the timing and percentage of sleep stages) is better conserved than with severe disease.

Diagnosis of OSA, cont'd

Severe – patients with an AHI/RDI/REI > 30 respiratory events/hour of sleep.

- Such patients more often have daytime sleepiness that interferes with normal daily activities. They tend to fall asleep often during the day (in a sitting posture) and are at risk for accidental injury from sleepiness.
- Patients with severe OSA are at increased risk for all-cause mortality and a variety of cardiovascular comorbidities, including hypertension, coronary artery disease, and arrhythmias.

DIAGNOSIS AND RECOMMENDATIONS [12,13]

WatchPAT Sleep Study Report

After testing via HSAT or PSG, providers will typically receive a diagnosis and recommendations from the specialty sleep physician. The diagnosis will state the degree of OSA severity and include recommendations including but not limited to:

- Treatment with PAP
- Possible ENT consultation to rule out specific causes of obstruction
- Review of proper sleep hygiene
- Weight loss recommendation
- Recommendation for the patient to avoid alcohol or sedatives

The sleep study detail includes:

- Patient information
- Sleep summary, including:
  - Start study time
  - End study time
  - Total recording time
  - Total sleep time; percent REM of Sleep Time
  - Respiratory indices

Index	Total Events	REM	NREM	All Night
pRDI	96	24.4	10.1	**15.0**
pAHI	74	20.3	7.1	**11.5**
ODI	80	22.1	7.5	**12.5**

Indices are calculated using technically valid sleep time.

pRDI: PAT Respiratory Disturbance Index
pAHI: PAT Apnea-hypopnea Index
ODI: Oxygen Desaturation Index: the number of times per hour of sleep that blood oxygen level drops by a certain degree from baseline.
REM: Rapid Eye Movement, a sleep stage
NREM: Non-Rapid Eye Movement, a sleep stage.

In this example, the Report Summary noted a total of 96 apneas. The pAHI was 11.5 events per hour and pRDI was 15 events per hour. The diagnosis was Obstructive Sleep Apnea with recommendations for PAP therapy, position therapy and alternative therapy, sleep hygiene, etc.

Note that this report indicated that pRDI was higher than pAHI. The sleep physician used pAHI to determine the severity of the OSA, yet it is also reasonable to use the pRDI. Center for Medicare and Medicaid uses both AHI and RDI in their local coverage determination.[17] AASM uses RDI, which included RERAs in addition to the AHI.[18] It is reasonable to use either of those indices, along with clinical information to reach diagnosis and proceed to treatment.[4]

MANAGEMENT

General Approach

The goals of OSA therapy are to resolve signs and symptoms of OSA, improve sleep quality, and normalize the apnea-hypopnea index and oxyhemoglobin saturation levels. OSA should be approached as a chronic disease that requires long-term, multidisciplinary management. The potential benefits of successfully treating OSA include clinical improvement (e.g., less daytime sleepiness), reduced health care utilization and costs, and, possibly, decreased cardiovascular morbidity and mortality.

General Issues for All Patients

Supportive Care — General measures include the following:

- All patients with OSA should exercise as tolerated, receive routine vaccinations, be counselled against cigarette and cannabis smoking (and vaping), and maintain a normal body mass index (BMI).
- Patients with OSA should also be treated for any comorbidities known to be associated with or worsen OSA.

Provide Education to the Patient: Once the diagnosis of OSA is confirmed and its severity determined, the patient should receive education with a focus on:

- What OSA is, the factors that worsen OSA and the consequences of untreated OSA.
- What is the treatment option?
- If PAP is indicated, what PAP therapy is, and the potential benefits of PAP therapy.
- Treatment of PAP therapy is a life-long therapy that does not cure OSA.
- Complete remission of OSA using risk factor modification is rare.

Behavior Modification: For patients who have OSA and a modifiable risk factor, we advise behavior modification. These include weight loss (for those who are overweight), altered sleep position (for those with positional OSA), and avoidance of alcohol and sedatives.

- Weight loss and exercise — Patients with OSA who are overweight or obese should be encouraged to lose weight and exercise. (See Weight-Management-CG.pdf).
    - Weight loss interventions, especially comprehensive lifestyle interventions, consisting of reduced-calorie diet, exercise, and behavioral guidance, are associated with improvements in OSA severity, cardiometabolic comorbidities and QOL.[27] Weight loss has been shown to decrease the apnea-hypopnea index (AHI; the number of apneas and hypopneas per hour of sleep), reduce blood pressure, improve quality of life, and probably decrease daytime sleepiness.
    - Exercise itself may modestly improve OSA even in the absence of significant weight loss.

- Non-supine sleep position — Some patients have OSA that develops or worsens during sleep in the supine position (typically observed during the diagnostic sleep study). These patients tend to have less severe OSA, be less obese, and be younger than patients who do not have positional OSA. For these patients, encourage sleeping in a non-supine position (e.g., lateral recumbent), which may correct or improve OSA, but is not routinely recommended over standard PAP therapy due to poor long-term compliance.

- Alcohol, sedating, and select medications avoidance — Patients should minimize or avoid substances that can act as central nervous system depressants, disrupt sleep architecture, and potentially worsen OSA and daytime sleepiness.

Management, cont'd

- Such medications include:
  - Benzodiazepine receptor agonists
  - Barbiturates
  - Other antiepileptic medications (e.g., gabapentin)
  - Sedating antidepressants (e.g., tricyclic antidepressants)
  - Antihistamines
  - Opiates
  - Select antidepressants may also worsen OSA control by causing weight gain (e.g., mirtazapine) or worsen sleep quality by causing restless legs syndrome or periodic limb movements.

POSITIVE AIRWAY PRESSURE THERAPY

PAP therapy is the mainstay of therapy for adults with OSA. PAP therapy serves to stent open the upper airway via a positive pharyngeal transmural pressure so that the intraluminal pressure exceeds the surrounding pressure and by increasing end-expiratory lung volume. Continuous positive airway pressure (CPAP) therapy has been shown to reduce fatigue and daytime sleepiness, improve quality of life, and lower blood pressure.

If HSAT is diagnostic for OSA, a trial period of APAP is recommended and does not require an offsite titration study.

INDICATIONS — initiation of PAP is generally indicated when:

- OSA with an AHI/RDI/REI ≥15 events/hr regardless of symptoms
- OSA with an AHI/RDI/REI of at least 5 events/hr with associated EDS, impaired neurocognitive function, mood disorders, insomnia, cardiovascular disease (e.g., HTN, ischemic heart disease), or a history of stroke

MODES OF ADMINISTERING POSITIVE AIRWAY PRESSURE

There are three main initial modes of PAP administration:

- Fixed-level CPAP
- Auto-titrating PAP (APAP)
- Bilevel PAP (BPAP), rarely used as an initial option

While CPAP was more commonly used in the past, in the era of home sleep testing, APAP is now more commonly used and is the mode of preference during pregnancy. Either APAP or CPAP is recommended for routine treatment of adults with OSA.

FIXED-LEVEL CPAP delivers PAP at a level that remains constant throughout the respiratory cycle.

- It is the simplest mode
- Most extensively studied and associated with more clinical experience.
- A pressure-relief setting (i.e., lowers the PAP at the onset of exhalation) is sometimes used to improve comfort and tolerance of the device.
- Determining the optimal fixed-level of CPAP requires titration.

APAP increases or decreases the level of PAP in response to a change in airflow, change in circuit pressure, or vibratory snore (i.e., signs that generally indicate that upper airway resistance has changed).

- The degree of improvement of major outcomes conferred by APAP and CPAP is similar.

Management, cont'd

- Performance of APAP can be highly variable, the body of evidence supporting its efficacy is more limited than that of fixed CPAP, and direct comparisons with fixed-level CPAP have not identified definitive benefits over CPAP.
- It is generally applied to patients without significant comorbidities and provides similar outcomes to in-lab CPAP titration while offering more convenience.

BPAP delivers a preset inspiratory PAP (iPAP) and expiratory PAP (ePAP). the degree of pressure support and consequently tidal volume is related to the difference between the iPAP and ePAP.

- It may be considered if the patient requires higher therapeutic pressure than can be provided by CPAP or APAP devices.
- It may be used for other forms of sleep-related breathing disorders associated with hypercapnia.

ORDERING PROCESS IN EHRS

1. Use the "Noninvasive Airway Assistive Devices (CPAP/BiPAP) DME PowerPlan in the Orders section
2. Order the appropriate device (CPAP/BiPAP permanent/temporary) and CPAP/BiPAP Supply
3. Settings: Type auto-pap/APAP or the necessary setting if ordering CPAP
4. Order the appropriate supplies needed and the mask size (you can hold the CTRL button to pick multiple supplies needed in 1 order)

NONADHERENCE TO PAP

In patients with OSA, nonadherence is generally defined as using CPAP for less than an average of 4 hours per night or less than 70% of nights (i.e., less than 5 nights per week) [27]. It has been estimated that almost half of patients are not adherent with CPAP use, when nonadherence is defined as being of less than 4 hours of use per night, with a range of 29 to 83 percent. Adherence improves in patients who receive early and continued education and support on the use of CPAP.

Recognition of nonadherence is important because there are a variety of educational, behavioral, and troubleshooting interventions that can help promote CPAP use, including troubleshooting device side effects and behavioral therapy.

- Educational interventions: focused on providing information **prior to** initiation of PAP about what OSA is, its downstream consequences, what PAP therapy is, and the potential benefits of PAP therapy. (Refer to the institution's LOP for education protocols)
- Behavioral interventions: focused on behavioral change **prior to** and during the initiation and subsequent use of PAP therapy using strategies such as cognitive behavioral therapy or motivational enhancement.
- Troubleshooting interventions: Interventions focused on close patient communication to identify Related problems and JHH potential solutions during initial period of PAP therapy.
- The intervention period may include interactions prior to, during and after Pap titration and follow-up.

FOLLOW-UP

Adequate follow-up, including troubleshooting and monitoring of objective efficacy and usage data to ensure adequate treatment and adherence should follow therapy initiation and during treatment of OSA. The first few weeks of therapy needs special attention since adherence over the first few days to weeks has been shown to predict long-term adherence. Refer to institution LOP for specific protocols/procedures.

Management, cont'd

The purpose of follow-up is to confirm adequate treatment, assess symptom resolution, and promote continued adherence to treatment. Usually after the initial weeks to months following Initiation to promote adherence and assess response to treatment, subsequent annual evaluation by a trained healthcare provider is appropriate. For selected patients who are highly adherent to PAP therapy, have sustained resolution of OSA related symptoms, and have no concerns regarding their PAP therapy, longer intervals of follow-up may be reasonable.

Meanwhile, patients with persistent or recurrent sleep-related complaints or persistent difficulties with PAP use should receive more frequent follow-up care. Note that routine sleep testing to reevaluate OSA status in patients on PAP therapy with good symptom control and no change in clinical status (e.g., significant weight loss or upper airway surgery) is considered low value care.

Maintenance of PAP machine:

PAP machines require regular maintenance to ensure optimal function. Patients should be educated about use and maintenance. See **Appendix C** for detailed instruction. Institutions may differ in the distribution of associated supplies.

Other therapies for OSA:

- Oral appliances: (i.e., mandibular advancement devices, tongue retaining devices) are an alternative therapeutic strategy in OSA that may be offered by a sleep specialist to patients with mild to moderate OSA who decline or fail to adhere to PAP therapy. Patients must not have craniofacial abnormalities, active dental disease, mandibular injuries, or preexisting temporomandibular joint dysfunction that would make such device ineffective. [29]

  A qualified dentist must provide oversight of oral appliance therapy in adult patients with OSA to survey for dental related side effects for occlusal changes and reduce their incidence. AASM suggests that sleep physicians conduct follow-up sleep testing to improve or confirm treatment efficacy for patients fitted with oral appliances [30.]

  The CCHCS/CDCR dental department does not prescribe, fabricate, or maintain oral devices for sleep apnea, and they are specifically excluded in the dental section of HCDOM at this time.

- Surgical: For selected patients who have failed the PAP therapy and oral appliance, surgical approaches, such as uvulopalatopharyngoplasty (UPPP), may be considered if the patient has obvious anatomical abnormality.[31] However, it may not provide complete, sustained treatment response, there may be an extended recovery period, and the patient may need to continue with PAP. Surgery should be the last option considered.

- There are some novel therapies for OSA, such as hypoglossal nerve stimulation. However, more research is needed to establish criteria for outcomes assessment, patient candidacy, predictors of treatment success, etc.[32]

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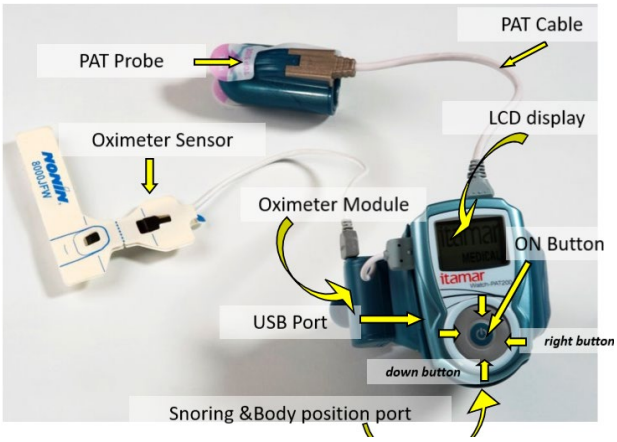
Appendix A

CCHCS utilizes the WatchPAT™ 300 (WP300) for HSAT testing in the institutions. See WatchPAT Training Guide.ppt (sharepoint.com) and WP200SBSGBRAcelete.fh9 (sharepoint.com) for directions on how to order and use the WP300.

The WP300 generates the following data:

- Peripheral Arterial Tone (PAT) respiratory disturbance index
- PAT apnea-hypopnea index
- PAT central apnea-hypopnea index
- Percentage of total sleep time with Cheyne-Stokes respiration pattern
- PAT sleep staging identification
- Sleep variables (e.g., sleep stages, sleep continuity) are typically NOT measured by the WP300, since EEG is not included.



The WP300 respiratory indices and sleep stages are estimates of conventional values and stages identification that are produced by PSG. The WP300 also generates optional acoustic decibel detector used for snoring level and body position discrete states from an external integrated snoring and body position sensor.

Process for Ordering the WP300 Sleep Study

1. Complete the RFS process for the sleep study
2. Fax order to 1-866-291-8990 or encrypt an email order to scheduling@sleepcareinc.com
3. Include name of patient, CDCR#, ordering physician, ship to address, and contact name and phone number
4. Sleep Care, Inc. enters the patient information into CliniSleep (Sleep Care, Inc's electronic medical record) and the patient is scheduled. CDCR/CCHCS staff have access to patient's schedule and results 24/7.
5. Unit is shipped to the institution.
6. When received, ducat the patient to issue the WatchPat sleep unit.
   a. Review instructions with the patient and dispense the sleep study unit
   b. Chart **Epworth Sleepiness Scale** in Ad Hoc Assessments in CERNER
   c. Measure neck circumference, weight, and height (convert to kg & cm)
   d. Keep box, new mailing label, RFS, and literature with phone numbers
7. Re-ducat the patient for the next day to return the equipment and complete forms
8. On return of the WatchPat sleep study unit:
   a. Check to make sure the WatchPat unit is intact with all parts
   b. Complete the post-diagnostic questions
9. Place the WatchPat Home sleep study unit back in original box – tape shut – apply new mailing label
10. Return the completed WatchPat unit in the box to Sleep Care, Inc**.**
11. On the same business day the unit is received, a Sleep Care Registered Polysomnographic Technologist (RPSGT) scores the study and sends to a Sleep Board Certified physician to interpret. The study is interpreted by the physician within three days.
12. The sleep study interpretation is immediately available in CliniSleep
13. Review results with the patient

Appendix B

CCHCS DME FORMULARY FOR CPAP/BIPAP

See CCHCS DME Medical Supply Formulary (sharepoint.com) for a complete list of indications.

NON-INVASIVE AIRWAY ASSISTIVE DEVICES (CPAP)

OSA INDICATIONS

OSA indicated by

1. Mild OSA defined as AHI between 5-15 determined by polysomnography and one or more of the following:
   - CVD (HTN, HF, stroke)
   - Excessive daytime sleepiness
   - Fibromyalgia-like symptoms
   - Headaches on awakening
   - Heartburn/reflux
   - Impaired cognition
   - Mood disorder
   - Night sweats
   - Observed apnea/choking
   - Snoring
   - Nocturia
2. Moderate/severe OSA with AHI> 15

CPAP ACCESSORIES

INDICATIONS

Humidifier: To relieve dry mouth, congested or runny nose, chapped lips, nosebleeds and improve compliance with CPAP use. Indicated in patients with the above symptoms or who are taking oral medications which can cause dry mouth.

Nasal Pillow CPAP with Headgear: CPAP Part. For patients who cannot wear a face mask due to:

- Claustrophobia
- Facial hair which prevents a good seal
- Facial deformity
- Patients with arthritis or muscle weakness (may be easier to put in place or adjust). May not be tolerated if CPAP is above 12 cm H2O due to discomfort of excessive turbulent airflow directly impacting the nasal mucosa. Heated humidification decreases nasal resistance by approximately 50% by raising the relative humidity of the PAP airflow

Appendix B, cont'd

NON-INVASIVE AIRWAY ASSISTIVE DEVICES (BIPAP)

INDICATIONS

OSA and BiPAP needed as indicated by 1 or more of the following:

1. Mild OSA defined as AHI between 5-15 determined by polysomnography and 1 or more of the following:
    - Documented cardiovascular disease
    - Excessive daytime sleepiness
    - Fibromyalgia-like symptoms
    - Headaches upon awakening
    - Heartburn and reflux
    - Impaired cognition
    - Mood disorder
    - Night sweats
    - Nocturia or nocturnal enuresis
    - Observed apnea or choking episodes
    - Patient is a commercial vehicle driver
    - Snoring
3. Moderate-severe OSA with AHI > 15
4. CPAP unsuccessful or not appropriate as indicated by 1 or more of the following:
    - Comorbid sleep-related hypoventilation (arterial, end-tidal or transcutaneous PCO2 > 55 mm Hg for > 10 minutes or increase in arterial, end-tidal or transcutaneous PCO2 of > 10 mm Hg above awake supine value resulting in PCO2 > 50 mm Hg for >10 minutes in a patient with OSA
    - Intolerance of CPAP pressures (difficulty exhaling against fixed airway pressure)
    - Titration study demonstrates OSA despite CPAP 15 cm H2O that is responsive to BiPAP

Appendix C

Please consult your institution's LOP/JLOP for specific OSA/PAP protocols.

Maintenance and Supply for APAP Machines

- Patients shall be instructed on ongoing maintenance and cleaning of a CPAP machine as instructed by the manufacturer and given a copy of manufacturer's instructions.
    - The maintenance procedure includes but is not limited to regular cleaning/washing of the humidifier, tubing, mask, and replacement of air filters as recommended by the manufacturer.
- Established Durable Medical Equipment (DME) procedures shall be followed as outlined in the DME policy (Health Care Department Operations Manual 3.6.1).
- Patients will be counseled on the supply replacement schedule including:
    - Disposable filters
    - Nasal & full-face mask
    - Tubing
    - Headgear/straps
- Distilled water will be supplied to the clinics with a usual par level of five gallons per yard. (Par level may vary at some institutions)
    - Patients submit a 7362 to request distilled water refill.
    - In general, a new one-gallon distilled water container will be exchanged on a one-for-one basis for an empty container.

November 2023

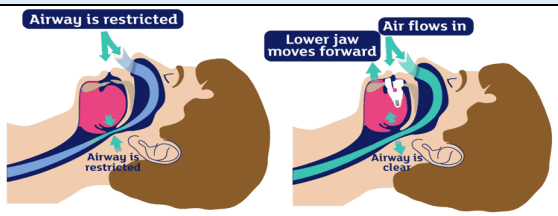
CCHCS Care Guide: Obstructive Sleep Apnea

Patient Education

Obstructive Sleep Apnea (OSA): What You Should Know

What is OSA?

- Obstructive sleep apnea is a medical condition when there are pauses in breathing during sleep.
- It is caused when your throat (upper airway) is partly or completely closed by your tongue.



Risk for OSA

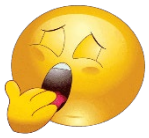
You are at risk for OSA if you:

- Are overweight
- Have congestive heart failure
- Have high blood pressure
- Had a stroke

How do You Know if You have OSA?

You may have OSA if you:

- Wake up often during the night
- Have loud snoring or choking during sleep
- Are sleepy or have low energy during the day
- Poor memory or not being able to focus
- Headaches in the morning



What You Can Do

- Lose weight
- Exercise
- Try not to sleep on your back
- Avoid alcohol

How is OSA Treated?

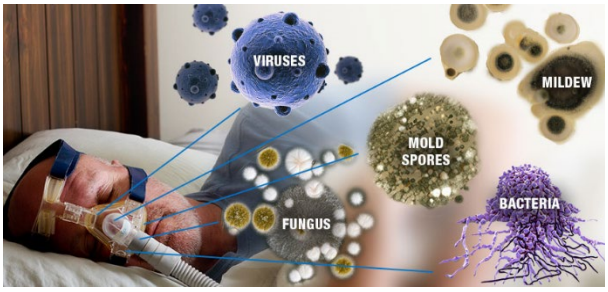
- If you have OSA, your doctor may prescribe a Continuous Positive Airway Pressure (CPAP) device to help you breathe at night.
- The device helps keep your airway open at night by creating air pressure through a mask worn when you sleep. Your health care team will help make sure the mask fits correctly.
- You must use the CPAP every time you sleep for it to help.
- The CPAP device, mask, and hose must be cleaned daily. Follow the directions provided by the RN on how to clean the device, mask, and hose.

Patient Education

Obstructive Sleep Apnea (OSA): What You Should Know

How to Clean the CPAP Machine

TIPS TO KEEP THE CPAP MACHINE CLEAN:

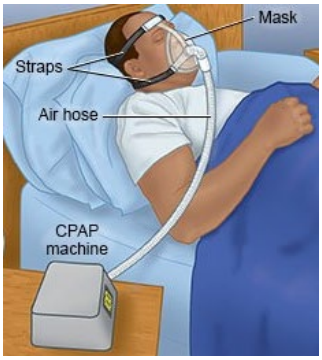


- It is important to keep your machine clean. If it is not cleaned, it can grow germs or fungus that can make you sick.
- Always follow the advice of your health care providers.
- If you have been sick, you will need to clean the machine more often.
- Do not use any perfumes or cleaning solutions other than gentle soap on your machine.

GENERAL DIRECTIONS ON DAILY CLEANING THE CPAP MACHINE

ALWAYS FOLLOW THE DIRECTIONS PROVIDED BY THE NURSE OR RESPIRATORY THERAPIST

1. Unplug the CPAP machine from the power source.
2. Disconnect the mask from the CPAP tubing. If the mask has headgear, remove or detach it. If there are other pieces that are easily reattached, these also can be separated.



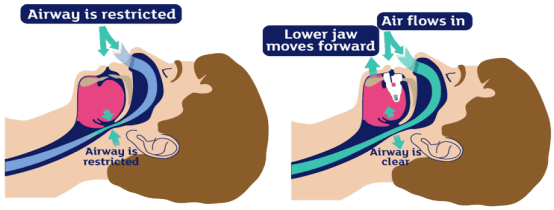
3. Remove the CPAP tubing from any connectors, the humidifier, or from the CPAP machine itself, if it connects directly.
4. If you have one, remove the water chamber from the humidifier unit of the CPAP machine, and separate it into its pieces (if this is easily done).
5. Wet a soft cloth with water. Wipe down the outside of the CPAP machine.
6. If possible, submerge the mask, headgear, tubing, and any connectors in water. Allow them to soak for about 30 minutes.
   - If you cannot soak the parts, wipe out the mask with a soft cloth and water and swish water through the tubing. Allow everything to air dry away from direct sunlight. These items should be cleaned every day.
7. The humidifier should be cleaned with distilled water. It should also be allowed to air dry. The humidifier should be cleaned daily.
8. After everything has air dried, reassemble the various parts.
9. Turn the machine on briefly and listen for any air leaks.

EDUCACIÓN PARA EL PACIENTE

Apnea Obstructiva del Sueño (OSA, por sus siglas en inglés): Lo Que Debe Saber

¿Qué es la OSA?

- La apnea obstructiva del sueño es una afección médica en la que se producen interrupciones en la respiración durante el sueño.
- Sucede cuando la garganta (vía respiratoria superior) está parcial o totalmente obstruída por la lengua.



Riesgo por OSA

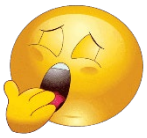
Corre el riesgo de padecer de OSA si:

- Tiene sobrepeso
- Tiene insuficiencia cardíaca convulsiva
- Tiene presión arterial elevada
- Tuvo un derrame cerebral

¿Cómo puede saber si padece OSA?

Puede padecer de OSA si:

- Se despierta con frecuencia durante la noche
- Ronca muy fuerte o se ahoga mientras duerme
- Durante el día tiene sueño o poca energía
- Mala memoria o falta de concentración
- Dolores de cabeza por la mañana



Qué Puede Hacer

- Perder peso
- Ejercicio
- Procurar no dormir boca arriba
- Evitar el alcohol

¿Cómo se Trata la OSA?

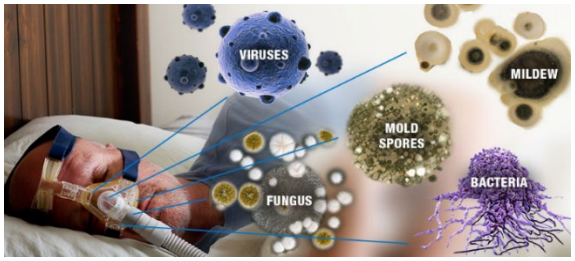
- Si padece de OSA, es posible que su médico le recete un Dispositivo de Presión Positiva Continua en las Vías Respiratorias (CPAP, por sus siglas en inglés) para ayudarle a respirar por la noche.
- El dispositivo ayuda a mantener abiertas las vías respiratorias por la noche creando presión de aire a través de una mascarilla que se usa al dormir. Su equipo de atención médica le ayudará a asegurarse de que la mascarilla se ajuste correctamente.
- El CPAP debe utilizarlo siempre al dormir para que le ayude.
- El dispositivo CPAP, la mascarilla y la manguera deben limpiarse a diario. Siga las instrucciones proporcionadas por el RN sobre cómo limpiar el dispositivo, la mascarilla y la manguera.

EDUCACIÓN PARA EL PACIENTE

Apnea Obstructiva del Sueño (OSA, por sus siglas en inglés): Lo Que Debe Saber

Cómo Limpiar el Dispositivo CPAP

Es importante mantener el dispositivo limpio. Si no se limpia, pueden crecer gérmenes u hongos que pueden enfermarle.



- Siga siempre los consejos de sus proveedores de atención médica.
- Si ha estado enfermo, tendrá que limpiar el dispositivo con más frecuencia.
- No utilice perfumes ni soluciones de limpieza que no sean un jabón suave en su dispositivo.

INSTRUCCIONES GENERALES PARA LA LIMPIEZA DIARIA DEL DISPOSITIVO CPAP

SIGA SIEMPRE LAS INDICACIONES DE LA ENFERMERA O DEL TERAPEUTA RESPIRATORIO

1. Desconecte el dispositivo CPAP de la fuente de energía.
2. Desconecte la mascarilla del tubo del CPAP. Si la mascarilla tiene protector de cabeza, quíteselo o despréndalo. Si hay otras piezas que se puedan volver a unir fácilmente, también se pueden separar.
3. Retire el tubo del CPAP de cualquier conector, del humidificador o del propio dispositivo CPAP, si se conecta directamente.
4. Si dispone de una, retire la cámara de agua de la unidad humidificadora del dispositivo CPAP y sepárela en sus piezas (si puede hacerlo de forma fácil).
5. Humedezca un paño suave con agua. Limpie el exterior del dispositivo CPAP.
6. Si es posible, sumerja en agua la mascarilla, el protector, los tubos y los conectores. Déjalos en remojo unos 30 minutos.
   - Si no puede mojar las piezas, limpie la mascarilla con un paño suave y agua y pase agua por el tubo. Deje que todo se seque al aire, lejos de la luz solar directa. Estos elementos deben limpiarse todos los días.
7. El humidificador debe limpiarse con agua destilada. También debe dejarse secar al aire. El humidificador debe limpiarse a diario.
8. Cuando todo se haya secado al aire, vuelva a montar las distintas piezas.
9. Encienda brevemente la máquina y escuche si hay fugas de aire.