

## Oral Appliance Titration (OAT)

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**SUMMARY:** Oral appliance therapy (OAT) is a treatment modality that can be offered to adults diagnosed with all severities of obstructive sleep apnea (OSA) (1). OAT may also be prescribed in conjunction with positive airway pressure (PAP) therapy or to those who are unable to tolerate PAP therapy. The patient is referred to a trained dentist who can custom make an oral appliance (adjustable mouthpiece) which is worn by the patient during sleep. The mouthpiece works to keep the lower jaw in a forward position to ensure that the upper airway does not collapse during sleep causing obstructed breathing and sleep disruption. OAT Therapy is not indicated in patients who have mandibular deficiencies that would prevent proper fit.

The American Academy of Dental Sleep Medicine (AADSM) recommends that following the final fitting of the oral appliance, the patient is referred back to the sleep center for another sleep study during which the patient will be wearing the mouthpiece to sleep (2). During the overnight study, the technologist will work closely with the patient and “titrate” the oral appliance to find an optimal therapeutic setting. The process will require the patient to work with the technologist to adjust the appliance to move the lower jaw and tongue forward to ensure the airway remains open and improve the patient’s apnea-hypopnea index (AHI).

According to the American Academy of Sleep Medicine (AASM) clinical practice guideline (3), the oral appliances should be fitted by a qualified dental professional who is experienced in the temporomandibular joint, dental occlusion and associated oral structures. This should be followed by an attended sleep study to verify efficacy. Regular follow up with a dental specialist is recommended to monitor patient adherence and evaluate the health of the oral structures and integrity of the occlusion (2).

The AASM clinical practice guideline (3) made two standard recommendations:

1. We recommend that sleep physicians prescribe oral appliances, rather than no therapy, for adult patients who request treatment of primary snoring (without obstructive sleep apnea).
2. We recommend that sleep physicians consider prescription of oral appliances, rather than no treatment, for adult patients with obstructive sleep apnea who are intolerant of continuous positive airway pressure (CPAP) therapy, bilevel (BPAP) therapy or prefer alternate therapy.

### KEY DEFINITIONS

**Apnea-Hypopnea Index (AHI)** refers to total apneas and hypopneas per hour of sleep.

**Oral Appliance Therapy (OAT)** is the use of a dental appliance worn in the mouth during sleep which helps to maintain a patent airway by preventing collapse of soft tissues associated with obstructive sleep apnea and to reduce or eliminate the vibration of tissues associated with snoring.

**Obstructive Sleep Apnea (OSA)** refers to a sleep disorder in which upper-airway narrowing contributes to breathing disturbances during sleep.

**Respiratory Disturbance Index (RDI)** (defined for use with Type I studies) refers to the total of apneas, hypopneas and RERAs per hour of sleep.

## **1.0 SCOPE**

This guideline addresses oral appliance titration and is based on the AASM Clinical Practice Guideline for the Treatment of Obstructive Sleep Apnea & Snoring with Oral Appliance Therapy: An Update for 2015 (3). The scope of this guideline is restricted to adult ( $\geq 12$  years) patients diagnosed with primary snoring or obstructive sleep apnea. Oral appliance therapy (OAT) titration should be performed in an accredited sleep facility by a registered sleep technologist and reviewed by a board-certified sleep specialist.

### **1.1 INDICATIONS FOR AN ORAL APPLIANCE TITRATION**

An oral appliance titration is indicated for patients who are diagnosed with primary snoring (without obstructive sleep apnea) or patients who have been diagnosed with obstructive sleep apnea but are intolerant to PAP therapy.

### **1.2 PATIENT REFERRAL**

Patients may be referred by a dentist or other sleep professional for an oral appliance titration or efficacy study. A medical history should be obtained as well as a sleep history and the diagnostic sleep study report. The order for the titration sleep study should be signed by a qualified and licensed sleep specialist.

### **1.3 CHART REVIEW**

The sleep technologist is responsible for ensuring that all required documentation (history, physical exam, previous test results, referral and insurance information, etc.) is available and reviewed prior to the oral appliance titration.

## **2.0 RECORDING TECHNIQUES**

An oral appliance titration should be performed using the standard sensors and data collection parameters for polysomnography (PSG) reflected in the current version of the AASM Manual for the Scoring of Sleep and Associated Events (4). The results should be validated, interpreted and reported by a board-certified sleep physician.

### **2.1 PHYSIOLOGICAL AND RECORDING PARAMETERS**

EEG electrodes should be placed at F3, C3, O1, M1, F4, C4, O2 and M2 according to the

International 10-20 System for Electrode Placement (4). The recommended EEG derivation is F4-M1, C4-M1, and O2-M1 recorded at a minimum sampling rate of 200 Hz with impedances of 5 K $\Omega$  or less. The recommended sampling rate is 500 Hz. Filter settings for this parameter are LFF 0.3 Hz and HFF 35 Hz.

EOG electrodes should be placed at E1 and E2 according to AASM Manual for the Scoring of Sleep and Associated Events standards (4). The recommended EOG derivation is E1-M2, E2-M2 recorded at a minimum sampling rate of 200 Hz with impedances of 5 K $\Omega$  or less. The recommended sampling rate is 500 Hz. Filter settings for this parameter are LFF 0.3 Hz and HFF 35 Hz.

Chin EMG electrodes should be placed above and below the mandible on the mental and submental muscles of the chin at ChinZ, Chin1 and Chin2 as specified in the AASM Manual for the Scoring of Sleep and Associated Events standards (4). The derivation for recording chin EMG consists of a submental electrode (Chin 1 or chin2) referred to the electrode placed above the mandible on the mental muscle (ChinZ). The minimum sampling rate is 200 Hz. The recommended sampling rate is 500Hz. Filter settings for this parameter are LFF 10 Hz and HFF 100 Hz.

The recommended airflow sensors for use during oral appliance titration are the oronasal thermal sensor and a nasal pressure transducer. The recommended respiratory effort sensor is calibrated or uncalibrated respiratory inductance plethysmography (RIP). The minimum acceptable sampling rate for the collection of respiratory data is 25 Hz. The preferred sampling rate is 100 Hz, which improves the ability to assess artifact and visualize cardiogenic oscillations. Filter settings for the respiratory data parameters are LFF 0.1 Hz, HFF 15 Hz.

The recommended blood oxygen sensor is a pulse oximeter with an averaging time of < 3 seconds. Finger probe placement is recommended. The minimum recommended sampling rate is 10 Hz. The preferred sampling rate is 25 Hz, which improves the ability to recognize artifact. The minimum acceptable sampling rate for recording body position is 1 Hz. A pulse rate is generally obtained from the pulse oximeter. The minimum acceptable sampling rate is 10 Hz. The preferred sampling rate is 25 Hz, which improves the ability to recognize artifact. When it is used in conjunction with the oximetry signal, the pulse rate signal may assist with oximeter artifact detection.

Modified Lead II is the recommended placement for recording the electrocardiogram (ECG). The minimum acceptable sampling rate is 200 Hz. The recommended sampling rate of 500 Hz improves waveform definition. Filter settings for ECG are LFF 0.3 (which minimizes waveform distortion), HFF 70 Hz.

The minimum acceptable sampling rate for the collection of snoring sound or vibration data is 200 Hz. The preferred sampling rate is 500 Hz, which improves waveform definition. Filter settings are LFF 10 Hz, HFF 100 Hz.

## **2.2 DESCRIPTION AND METHODOLOGY FOR ORAL APPLIANCE**

### **TITRATION**

Oral appliance titration studies should be performed using the following algorithms unless physician-ordered or manufacturer specifications direct otherwise. These algorithms are detailed in section 2.2.2. Inform the patient why the appliance may need to be adjusted during the night and how adjustments will be made. Permission is needed from the patient to adjust the appliance during sleep. Some patients are instructed by their dentist to make their own adjustments.

Some sleep centers may utilize computer assisted remote control advancement of the lower jaw during a PSG, prior to beginning OAT, in an effort to predict the best responders and the final mandibular protrusion setting. The predictive accuracy and treatment utility of pretreatment testing has not been fully established and is not universally accepted at this time.

#### **2.2.1 SUPPLEMENTAL OXYGEN**

The use of supplemental oxygen (O<sub>2</sub>) should be limited during OAT titration, and must be ordered by a physician if needed to attain an appropriate titration for each individual patient. AASM Clinical Practice Guidelines recommend the use of supplemental O<sub>2</sub> during oral appliance titration when baseline awake supine SpO<sub>2</sub> on room air is less than 88% for 5 minutes or longer (3). Supplemental oxygen should be introduced via nasal cannula. The recommended minimum starting rate for adult patients is 1 L/min. Titrate O<sub>2</sub> in 1 L/min increments with an interval of no less than 15 minutes until SpO<sub>2</sub> is between 88% and 94%.

#### **2.2.2 TITRATION PROCEDURE**

At least 30 minutes of total sleep time at baseline should be recorded at the patients' currently titrated position. Enter patients' titrated mm at lights off as PAP event. If apneas, hypopneas, or snoring are present after 30 minutes and no written protocol has been prescribed by the physician or dentist, the mandible will be advanced 1mm initially. To advance the appliance follow the manufacturer's guidelines.

Adjustments should be made in 1 mm increments starting after the first 30 minutes of recording if the AHI is > 10. The technologist should remotely advance the device (when possible) or awaken the patient and have the patient advance the screw mechanism by 1 mm. The technologist may need to advance the device in some instances. Adjustments of 1 mm should be made in 30 minute increments for obstructive apneas or hypopneas. For snoring occurring without obstructive apneas or hypopneas .5 mm adjustments may be made. If at any time during the titration events increase that are not associated with body position or sleep stage, the appliance should be returned to the previous position. Adjustments should be stopped if the patient complains of pain or serious discomfort on his/her teeth, temporomandibular joint or face. Upon completion of the titration, prior to discharging the patient, the oral appliance should be returned to its original prescribed settings and the patient instructed to follow up with their dentist for any prescription changes.

### **3.0 TECHNICAL DOCUMENTATION**

Technical documentation is required during the recording and includes the PSG generated recording report with the baseline position of the oral appliance documented. Log the adjustments made to the oral appliance and the rationale (adjusted for snoring and hypopneas, adjusted for patient comfort, etc.). Tag adjustments in the same manner as pressure adjustments for PAP settings so that they will correlate in the report with sleep and breathing tabulations. Technical documentation includes a technologist generated log of all events, observations and interventions that occurred during the oral appliance titration.

The sleep technologist records the following information:

- Time/epoch
- Event type (obstructive, central, mixed, hypopnea, snoring or desaturation)
- Body position
- Sleep stage
- Patient behavior (restless, complaints)
- Snoring
- Lowest SpO<sub>2</sub> and presence/absence of arrhythmia
- Presence/absence of arousal associated with events.
- Current position of oral appliance
- Adjustments made to oral appliance
- Comments

### **3.1 RECORDING SUMMARY**

The scoring technologist stages and event scores the OAT titration recording and generates a preliminary report for the board-certified sleep physician to review. Recommendations require consistent collaboration and regular in servicing of technical staff performing OTA titrations on the use of specific oral appliances by a qualified dentist.

### **4.0 RESULTS REPORTING**

The sleep physician is responsible for reviewing the raw scored data from the OAT titration and the preliminary report. The sleep physician generates the final report with recommendations for OAT settings during home use. The report will be sent to the referring provider. The patient must follow up with their dentist for prescribed adjustments.

### **5.0 STANDARDS OF PRACTICE**

#### **5.1 QUALIFICATIONS OF SLEEP TECHNOLOGISTS**

Sleep technologists performing oral appliance studies should demonstrate knowledge of the application and limitations of oral appliance devices and the PSG recording instruments. The sleep technologist must be able to accurately assess and summarize PSG recordings to arrive at the optimal therapeutic settings for OAT therapy. Ongoing collaboration and in servicing of technical staff on specific oral appliances by dentists referring to the sleep center is essential.

Technologists should be trained by the vendor in the use of remote-controlled titrating systems; the dentist fabricates the appliance for the MATRX titration night and may prescribe a titration range.

## **5.2 SLEEP FACILITY ORGANIZATION AND RECORD KEEPING**

Sleep technologists performing oral appliance titrations should follow the sleep facility departmental policy and procedure manual guidelines. Patient charts, in either print or electronic format, should be organized and available for use in the sleep facility (5). HIPAA guidelines should be followed to meet documentation and confidentiality requirements. Records and recordings should be secure and retrievable and stored in accordance with state guidelines for the length of time designated by the statutes (generally a seven-year minimum).

## **5.3 EQUIPMENT SAFETY**

Equipment and sensor use and maintenance should meet manufacturer standards. All electronic equipment used for diagnostic and therapeutic sleep testing must be inspected and maintained by a trained biomedical technician, and those actions must be documented (5).

## **5.4 INFECTION CONTROL**

Sleep technologists must use universal precautions to prevent the spread of infectious disease. Frequent hand washing is essential for protection of both patient and technologist, and should be performed before and after all patient contact and after glove removal. The technologist must wear gloves when performing direct patient contact. For the same reasons, the patient should be responsible for the appliance adjustments when possible.

### **5.4.1 EQUIPMENT DECONTAMINATION**

All equipment and sensors, masks and belts coming into contact with the patient will be handled as contaminated per sleep facility policy and procedure. Clean and dirty equipment must be kept in distinct areas designated as clean or dirty. All dirty equipment must be cleaned and disinfected after each use according to manufacturer guidelines. Single use items are to be discarded after each use (6).

## **REFERENCES**

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