



## Positive Airway Pressure Acclimation and Desensitization

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**SUMMARY:** Positive Airway Pressure (PAP) applied through a nasal, oral, or oronasal interface during sleep is the preferred treatment for patients with moderate to severe Obstructive Sleep Apnea (OSA) (1). American Academy of Sleep Medicine clinical guidelines indicate that all potential PAP titration candidates should receive adequate PAP education, hands-on demonstration, careful mask fitting, and acclimatization prior to titration (2). The sleep technologist is an integral member of the team caring for patients with OSA and is tasked with providing education and care for patients undergoing PAP titration in the sleep center. Acclimation should include education that provides indications and rationale for PAP usage and potential side effects, and careful fitting of the PAP interface (i.e., nasal mask, nasal pillows, full-face mask). The patient should be acclimated to PAP, wearing the interface with the pressure on, prior to “lights off.” (3) PAP desensitization, generally conducted during daytime sessions with a sleep technologist, is used when patients who would benefit from PAP therapy have difficulty acclimating to therapy.

### KEY DEFINITIONS

**Acclimation** – Techniques used to familiarize patients with PAP therapy.

**Auto PAP (APAP)** – Automatic Positive Airway Pressure; device designed to provide air pressure at a customized, regularly adjusted level.

**Bi-level PAP (BPAP)** – positive airway pressure delivered with differing pressures for inhalation (IPAP) and exhalation (EPAP).

**CPAP** – Continuous Positive Airway Pressure; device designed to deliver positive airway pressure at a consistent level.

**Desensitization** – Techniques used to assist patients having difficulty acclimating to PAP therapy.

**Full Face Mask** – Generic term for any PAP mask or interface that covers both the nostrils and the mouth.

**Leak** – Measured in Liters/minute (L/min); unintentional leak in the patient PAP circuit, often caused by a poor interface seal or mouth leaks.

**Nasal Interface** – Generic term for any PAP mask or interface that covers only the nostrils.

**OSA** – Obstructive Sleep Apnea.

**PAP** – Positive Airway Pressure therapy using CPAP, Bi-level PAP, Auto CPAP, or SV.

**Servoventilation (SV)** – a PAP device that uses a computer controlled valve to deliver airflow and pressure to the patient on a breath by breath basis.

**Split Night Study** – Two-part study comprised of a diagnostic baseline and a PAP treatment component.

## **1.0 SCOPE**

This guideline describes the procedure for determining the appropriate PAP mask or interface type and fit, discusses techniques for optimally acclimating patients to PAP therapy and provides methods for PAP desensitization when it is necessary to assist patients to utilize PAP therapy.

## **2.0 EQUIPMENT AND SUPPLIES**

- PAP devices
- Humidifiers
- Interface sizing gauges
- Interfaces, headgear and hoses/valves
- Chin straps

## **3.0 PAP ACCLIMATION**

All patients who undergo a sleep study with PAP therapy, including CPAP, BPAP, APAP, Servoventilation or a split-night PAP study require acclimation to PAP. Acclimating to PAP can be maximized by offering interface options, positive feedback, expression of empathy and understanding, and reassurance and praise for even minimal effort. Introducing PAP prior to beginning the titration study, giving the patient control over the mask and allowing him to touch or reposition the mask as needed, and using distraction measures such as television, radio, or counting are useful acclimating techniques (4).

## **4.0 PREPARING THE PATIENT FOR PAP**

PAP acclimation should be undertaken prior to electrode application in the patient's bedroom. Begin by reviewing the physiology of OSA and the rationale for PAP and how it works with the patient. A PAP educational video may be a useful tool to assist with patient education. Research findings indicate that patients who have been educated on treatment interventions as well as the disease state of obstructive sleep apnea show increased adherence to PAP over patients who were not provided education and support (4).

### **4.1 Interface Selection and Mask Fitting**

Unless a specific interface is specified by the ordering physician, begin the process by offering the patient several nasal masks. For patients requiring PAP desensitization, the interface can make or break the success of the encounter. It is therefore very important that the best interface option is chosen for the patient. It is equally important to inform the patient that there are many different types of interfaces available. Inform the patient that interface choice tends to be personal preference, that there are pros and cons to all interfaces, and that finding the best interface may require some fine tuning.

Some things to consider when choosing an interface for a patient include nasal or facial abnormalities, facial hair, and claustrophobia. If a patient is claustrophobic, choosing a nasal interface style that does not interfere with the patient's field of vision is a good choice. Patients with facial hair may do better with a nasal pillow interface. (Note: Do not use

nasal pillows for SV titrations, per manufacturers' guidelines.) The patient should be given two to three options to choose from.

Determine if the patient is a mouth breather. Some patients are mouth breathers due to an anatomical problem such as nasal polyps or cysts or structural problems from broken nasal cartilage. Others may be habitual mouth breathers who actually can breathe through their nose. Ask the patient to attempt breathing through his nose, and if he is able to do so begin with a nasal interface. If nasal breathing is impossible due to an anatomical or structural problem, fit the patient with a full face mask.

Once an interface style has been selected, the technologist must determine the proper size for the patient. Utilize a sizing gauge to determine the patient's mask size. The correct mask size is essential to limit mask leaks. The goal is to fit the patient with an interface that is comfortable, seals well and does not leak when the blower is on. Try different mask styles if necessary to reach this goal. These efforts will serve to minimize the side effects of PAP and therefore maximize therapeutic value, compliance and the patient's quality of life.

#### **4.2 Acclimating the Patient to Pap Pressure**

PAP therapy should be introduced gradually. Begin by allowing the patient to hold the interface. Have the patient hold the mask to his nose and breathe through it, without the PAP hose connected. Instruct the patient to close his mouth and breathe in and out through his nose. Connect the nasal exhaust port to the hose and interface. Select a CPAP pressure of about 4.0 cm/H<sub>2</sub>O to begin with. For Bi-level PAP start at 8 IPAP/4 EPAP. Have the patient hold his hand over the interface opening to feel the air pressure, then have him place the mask over his nose and instruct him to breathe in and out through his nose with his mouth closed. Have the patient practice breathing with the interface for approximately 3 to 5 minutes, while positively reinforcing proper breathing techniques. Offer encouragement, such as: "The next step is to let you experience a range of pressures so you will know what to expect tonight", or in the case of a split-night study "if we decide to use CPAP tonight during the study". It is new and different, but I know you can do this."

If the patient is having difficulty acclimating to PAP therapy, ask questions to pinpoint the specific problem. Issues such as dryness, interface discomfort, nasal congestion, difficulty exhaling and/or leaks must be addressed promptly. If the patient is having difficulty with exhalation against the pressure, consider using pressure relief.

Once the patient is comfortable with the PAP pressure, prepare him for the PSG recording. Next fit the PAP mask and headgear, taking care not to over-tighten the mask. Instruct the patient how to connect and disconnect the nasal interface from the PAP hose connection. This will give him a sense of control if he needs to discontinue the PAP during the night. Be sure to minimize leaks and teach the patient to re-seat the mask if he feels a leak around the seal. Explain the difference between the exhalation port leak (which is essential for release of carbon dioxide) and a leak around the seal (which needs adjustment). If the patient is unable to keep his mouth closed consider a chinstrap or a full face mask.

Prior to lights out remind the patient to breathe in and out through the nose with his mouth closed. Repeating this instruction increases the likelihood that the patient will retain this important information. Inform the patient you will be available for help throughout the night and that he should tell you if he is having any problems during the night so that you can make any necessary adjustments to the equipment or mask. Explain that PAP therapy is generally well tolerated and he should not hesitate to let you know if there are any problems.

Patients often awaken during a titration and complain of the high pressures. The pressure may be reduced while the patient is awake in order to facilitate the return to sleep. Once the patient returns to sleep, pressures should

be increased gradually but expeditiously to the required therapeutic level. If a patient is unable to tolerate and chooses to discontinue PAP therapy, the masks/interfaces used and reasons for the patient's inability to tolerate PAP therapy must be documented for the physician. This documentation is valuable for the physician who will determine if desensitization is an option for the patient and for the technologist who later attempts desensitization therapy with the patient. When a patient is unable to acclimate to PAP during a titration study, desensitization carried out in the PAP clinic and/or at home is often successful.

### **4.3 Improving Patient Comfort and Tolerance During Pap Titration**

Leaks occur and can be normal, but commonly are due to ill-fitting headgear, improper mask size, defective tubing or attachments, or mouth leak. Leak rate charts specific to the mask being used are useful to determine an acceptable leak value. Determine the reason or reasons for the leak and attempt to reduce the leak by reseating the mask, assuring that the mask is not over tightened, using a chin strap or full face mask if mouth leak is evident, or trying a different mask or interface. Leaks at the eyes or pressure on the bridge of the nose may be resolved using a mask with an adjustment at the bridge of the nose.

There should be several different types of PAP interfaces (i.e., nasal mask, nasal pillows, full-face/oronasal mask) and accessories (chinstrap, heated humidifier) available if the patient encounters problems (e.g., mouth leak, nasal congestion, or oronasal dryness) during the night.

If the patient is struggling with the PAP pressure and is using nasal pillows, try switching to a standard nasal mask. Using pressure relief technology or switching to bi-level therapy (BPAP) may allow the patient to tolerate PAP. Pressure waveform modification technologies (such as pressure relief) may improve patient comfort and adherence with PAP (1). BPAP is an optional therapy in some cases where high pressure is needed and the patient experiences difficulty exhaling against a fixed pressure (1).

Complaints of dryness in the nose, throat, and mouth are commonly due to inadequate humidification. Heated humidification is the best method for addressing complaints of dryness. If the patient complains of a "burning sensation" in their nose, the temperature on the heater may need to be increased. If the patient wakes up complaining of dryness in the throat or mouth, which is likely caused by mouth breathing, adding a chinstrap along with increased heat may correct the problem. Note, however, that too much humidification can cause a "rain out" effect (water buildup) in the tubing and/or interface.

## **5.0 USE AND CARE OF PAP EQUIPMENT**

Patients should be educated about the function, care, and maintenance of their equipment, the benefits of PAP therapy, and potential problems (5). Selection of the most appropriate PAP interface, use of heated humidification and a thorough educational program that encompasses all members of the healthcare team are the primary methods shown to improve PAP utilization. The use and care of PAP equipment, including explanation of the parts and assembly of all equipment, how and when to clean equipment, and the importance of daily/nightly use, should be discussed in detail with the patient or caregiver, preferably following the PAP titration study (5).

Patients should be informed of common complications of PAP that may cause adherence issues and instructed to contact their care provider or the sleep center if they encounter any of these problems. It is helpful to assure patients that these complications can be addressed in a variety of ways.

## 6.0 PAP COMPLIANCE

PAP compliance is best when patients are educated about their disorder and treatment and the education process begins with the primary referring physician. Establishing a standard practice for PAP therapy that includes education and cooperation from all care providers is essential (6). Troubleshooting and addressing problems related to PAP use, managing side effects, and utilizing methods to increase PAP adherence should be an integral part of the follow-up for patients using PAP, particularly in the first week of therapy (7).

The most common reasons for non-compliance to PAP are:

- inadequate patient education
- interface difficulties
- abbreviated titration (an unsuccessful split-night titration)
- difficulties falling asleep
- arousals
- claustrophobia/anxiety
- airway dryness/irritation
- difficulty exhaling against the pressure
- worries about social acceptance

### 6.1 Patient Assessment

To begin your assessment of compliance issues, it is helpful to determine if the patient is accepting of treatment. Does the patient understand the consequences of untreated sleep apnea and the benefits of therapy?

Interface issues can be resolved. Interaction with the patient is essential if you are trying to resolve an interface issue. Some common discussion points that will help you to resolve an interface issue include these questions.

- **Does the patient find the mask comfortable?**
  - Does it fit properly?
  - Does the patient like the style?
- **Is nasal obstruction a problem?**
  - Does the patient have a deviated septum, allergies, or sinus problems?
  - Is the patient able to breathe through his nose?

Other interface issues to consider are air leakage and skin irritation or skin breakdown. Air leakage near the eyes can cause conjunctivitis. Skin irritation and breakdown are most often caused by over tightening of the interface. Both issues are easily resolved by fitting a more appropriate interface for the patient. Skin issues can be addressed by utilizing a different interface, such as nasal pillows. Some patients switch between a nasal mask and nasal pillows routinely to avoid skin irritation and breakdown issues. Mask leaks are commonly associated with ill-fitting headgear, improper mask size, or defective tubing or attachments, and can be corrected with some diligence on the part of the technologist.

Difficulty exhaling against the pressure can be alleviated using a variety of techniques. Decreasing pressure, particularly as the patient is falling asleep, can be accomplished using the ramping function of the PAP device.

Assure that the ramp function is set appropriately, and show the patient how to reset the ramping function if he wakes and has difficulty tolerating the pressure during the night. Pressure relief and bi-level settings are also very useful methods of addressing this issue. Auto-titrating PAP (APAP) can also be considered in the management of OSA in CPAP intolerant patients (1).

Dry and irritated airways commonly occur in patients using PAP. Increasing ambient humidity with a cool pass over or heated humidifier should be standard for all patients. The interface may contribute to airway irritation as well; people with chronic sinus problems may have difficulty using a nasal pillow interface. Airway dryness issues are generally best addressed using heated humidification. Keep in mind, however, that there may be other problems contributing to airway irritation. Cleanliness of equipment, particularly the humidifier, method of cleaning, or the water used in the humidifier can also cause airway irritation. Verify that the patient is using distilled water in the humidification system. Tap water often contains chlorine and can cause irritation and burning sensations in the airway. Assure that the patient is not cleaning the mask, hose or humidifier with harsh chemicals, and that he is rinsing the equipment thoroughly after cleaning.

Mouth breathing can also contribute to airway dryness. Habitual or essential mouth breathing can be identified by having the patient demonstrate his ability to breathe through his nose and assessing if the patient's nasal airflow is actually limited. Mouth breathing can also be assessed by watching the patient to see if he mouth breathes while you are explaining procedures. Using a chin strap to keep the mouth closed will improve complaints of a dry mouth and throat. When mouth breathing is a result of a nasal deformity that truly limits or prevents the patient from breathing through the nose, a full face mask will allow humidification to reach the airway.

Claustrophobia and anxiety can sometimes be alleviated by using a different interface. Nasal pillows or interfaces that do not obstruct patient vision are often helpful. Occasionally, a full face mask may be a better choice for a claustrophobic patient. A full face mask may also be better tolerated by scuba divers and firefighters, who are accustomed to breathing through the mouth.

The goal is to alleviate any issues that the patient may be experiencing. It is important to find the most comfortable and leak-free interface for each patient, address pressure and dryness issues, and provide the education necessary to improve compliance with therapy. Claustrophobia and inability to tolerate PAP pressures are the primary reasons that patients undergo PAP desensitization.

## **7.0 PAP DESENSITIZATION**

PAP desensitization is generally undertaken with patients who were unable to tolerate PAP during a titration study due to claustrophobia or inability to tolerate PAP pressures. On occasion patients who were successfully titrated find they cannot use PAP at home and are referred for desensitization. PAP desensitization can be performed in the sleep clinic, sleep center, or the patient's home. It is most often initiated in the sleep clinic or sleep center, and continued in the patient's home until the patient has acclimated to the mask and pressure sufficiently to return for a PAP titration study. PAP desensitization initiated in the sleep clinic or sleep center should be performed in a quiet area using a recliner or in a patient bedroom.

### **7.1 Desensitization Techniques**

1. Measure the patient carefully and select an appropriate interface and head gear.
2. Allow the patient to handle the mask himself, holding it to his face to assess fit, prior to connecting the mask to the hose or PAP instrument.

3. Connect the hose to the mask and PAP instrument and allowing the patient to hold the mask to his face, gradually introduce pressure at 2-4 cm/H<sub>2</sub>O. It is important to allow the patient to have control of the mask.
4. Once the patient is comfortable holding the mask to his face and breathing with PAP at a low pressure turn off the pressure and fit the mask and headgear. Show the patient how to disconnect the hose from the mask, and have him recline in a recliner or lie supine on a bed.
5. Re-initiate pressure at 2-4 cm/H<sub>2</sub>O using heated humidity while the patient is lying down. Offer encouragement, such as “It looks like you are breathing comfortably at this pressure” or “You are doing fine; remember that this is going to help your breathing while you sleep.”
6. If the patient is having any difficulty at this low pressure refrain from increasing the pressure. In some cases distraction techniques such as watching TV or reading may help the patient to tolerate the procedure.
7. If the patient is tolerating the low pressure well, inform him that you will be gradually increasing the pressure. Remind him that he can disconnect the hose if the pressure becomes intolerable. This allows the patient to remain in control of the process.
8. Verify that there are no interface leaks or other issues prior to beginning to increase PAP pressure.
9. Increase pressures gradually in 1 cm increments in a ramping fashion, carefully monitoring patient reaction and tolerance. In general pressures should be increased to about 8 cm/H<sub>2</sub>O during the desensitization process.
10. Check for leaks and adjust interface fit if necessary, changing interface styles as needed. Utilize a chin strap or full face mask if mouth breathing is occurring.
11. If the patient is having difficulty tolerating higher pressures, particularly exhaling against the pressure, try using pressure relief or bi-level PAP.
12. Remember to continue to reassure the patient and reinforce his success. For example, “You are doing well, keep it up”. It is very important to make this a positive experience for the patient.
13. When the patient is able to tolerate 8 cm/H<sub>2</sub>O for approximately 15 minutes the desensitization is considered successful. When desensitization is successful, the patient should be able to tolerate a PAP titration study.
14. At the conclusion of the desensitization, ask the patient to summarize his experience. Document your assessment as well as the patient’s responses.
15. If the patient is having difficulty with the mask/interface or does not tolerate the desensitization procedure in the sleep clinic or sleep center, consider sending the patient home with the PAP equipment to continue the process at home for a period of one to two weeks.
16. Send the patient home with written instructions for the process he is to follow at home. Some patients will need to become tolerant of the mask alone at home. This can be accomplished by instructing the patient to wear the mask in the evening while watching TV until he can tolerate it for at least 30 minutes. Once the mask is tolerated desensitization in the sleep clinic or sleep center can be attempted again.
17. If the patient tolerated the mask, but had difficulty with the pressure consider sending him home with a PAP device set to approximately 8 cm/H<sub>2</sub>O and a 30 minute ramp time. Instruct the patient on how to reset the ramp to lower the pressure at any time, and encourage him to practice outside of the sleep period, perhaps while reclining and watching TV in the evening, until he is able to tolerate the pressure at 8 cm/H<sub>2</sub>O. Once this is accomplished, the patient can be scheduled for a PAP titration study.

Because the patient is awake and aware, the desensitization process can be difficult. The technologist must be patient and encouraging. Explain to the patient that with practice and time most patients are able to tolerate and benefit from PAP therapy. Desensitization techniques, interface options, pressure relief technology, and humidification along with encouragement from the technologist and the expression of empathy, understanding and praise for the patient’s efforts go a long way toward assisting the patient to accept PAP therapy and ultimately achieve PAP compliance (4).

## REFERENCES

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