

Positive Airway Pressure Acclimation and Desensitization

Updated May 2022

SUMMARY

Positive Airway Pressure (PAP) applied through a nasal, oral, or oronasal interface during sleep is the preferred treatment for patients with Obstructive Sleep Apnea (OSA) (1). The 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, 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.” 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.

Adaptive Servoventilation (ASV) – a PAP device that uses a computer controlled valve to deliver airflow and pressure to the patient on a breath-by-breath basis. Measures breathing patterns and customizes the pressure delivered to stabilize breathing.

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

Bilevel 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 oronasal 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 including nasal pillows.

OSA – Obstructive Sleep Apnea.

PAP – Positive Airway Pressure therapy; can include CPAP, Bilevel PAP, Auto PAP, ASV, VAPS.

VAPS – Volume Assured Pressure Support; refers to hybrid modes of ventilation that aim to provide a minimum level of ventilation by automatically varying the level of pressure support provided by the device.

Split Night Study – Two-part study that includes 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 cushions
- Tubing/valves
- Chin straps
- Filters

3.0 PAP ACCLIMATION

All patients who undergo a full-night or split-night sleep study with PAP therapy require acclimation. Acclimation 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 them to touch or reposition the mask as needed, and using distraction measures such as television, radio, or counting are useful acclimating techniques (3).

4.0 PREPARING THE PATIENT FOR PAP

PAP acclimation should be undertaken prior to electrode application in the testing room. Begin by reviewing the physiology of sleep apnea, with the rationale for PAP and how it works for 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

Considerations 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 can lessen their claustrophobia. Patients with facial hair may do better with a nasal pillow interface. Ideally, the patient should be given two to three options.

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 but can actually breathe through their nose. Ask the patient to attempt breathing through his nose, and if they are 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.

Unless the physician orders a particular interface, begin the process by offering the patient several interfaces. 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 be chosen for the patient. It is equally important to inform the patient that there are many different types of interfaces available, and that interface choice tends to be personal preference. There are pros and cons to all interfaces. Finding the best interface may require some fine-tuning.

Once an interface style has been selected, the technologist must determine the proper size for the patient. Utilize a manufacturer's sizing gauge specific to the selected interface. The correct mask size is essential to patient comfort and 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 PAP unit is running. Try different interface styles, if necessary, to reach this goal. These efforts will serve to minimize the side effects of PAP, therefore maximizing the 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 with the patient in a seated position. Have the patient hold the interface to their nose and breathe through it, without the PAP hose connected. Instruct the patient to close their mouth and breathe in and out through their nose. Have the patient remove the interface from their nose. Connect the tubing and interface. To start, select a CPAP pressure of 4.0 cmH₂O. For BPAP, start at 8 IPAP/4 EPAP. Have the patient hold their hand over the interface opening to feel the air pressure and then place the mask over their nose. Instruct them to breathe in and out through their nose with their mouth closed. Explain to the patient that it is normal to feel resistance with exhalation. Have the patient practice breathing with the interface for approximately 3 to 5 minutes, while positively reinforcing relaxed breathing.

If the patient is having difficulty acclimating to PAP therapy, ask questions to pinpoint the specific problem. The technologist must address issues such as dryness, interface discomfort, nasal congestion, difficulty exhaling and/or leaks promptly. If the patient is having difficulty with exhalation against the pressure, consider using pressure relief. If the difficulty continues, employ breathing techniques (i.e. encourage the patient to continue wearing the interface, suggest exhaling completely, and then reinitiate relaxed breathing).

Continue encouraging statements, such as: "This is all new and different, but you can do this! The next step is to let you experience a range of pressures so you will know what to expect during the study." Once the patient is comfortable with the PAP pressure, prepare them 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 interface from the PAP tubing connection. This will give the patient a sense of control if there is a need to remove the interface during the study. This is an ideal time to transition the patient to the bed and the reclining position. Be sure to minimize leaks, and teach the patient to adjust the mask if they feel discomfort or 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 their 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 their mouth closed. Repeating this instruction increases the likelihood that the patient will retain this important information. Inform the patient that you will be available for help throughout the night and that they should tell you about any problems during the night so that you can make any necessary adjustments to the equipment or mask.

Patients may awaken during a titration and complain of the high pressures or difficulty exhaling against the pressure. 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 PAP therapy and chooses to discontinue it, the masks/interfaces used and reasons must be documented, in detail, 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 often occur and can be normal, but may also be corrected. Common causes of mask leaks include ill-fitting headgear, improper mask size, or defective tubing or attachments. Manufacturer leak rate charts, specific to the mask being used, are useful to determine an acceptable leak value.

Strategies for addressing leaks include:

- Attempt to reduce the leak by reseating the mask
- Ensure the mask is not over tightened
- Try a different mask interface
- Introduce a chinstrap or full-face mask if mouth leak is unresolved

Leaks at the eyes or pressure on the bridge of the nose may be resolved by using a mask with an adjustment at the bridge of the nose. Facilities should be prepared to address mask interface complaints such as leaks and nasal/oronasal congestion or dryness during the night by supplying:

- Different mask interfaces - nasal mask, nasal pillows, full-face/oronasal mask
- Accessories - chinstrap, heated humidifier

If the patient is struggling with the PAP pressure and is using nasal pillows, it is recommended to attempt changing to a standard nasal mask. For patients experiencing difficulty exhaling against the incoming pressure, using pressure relief technology or switching to bilevel therapy (BPAP) may improve the patient's comfort and ability to tolerate PAP therapy. Pressure waveform modification technologies (such as pressure relief) reduce expiratory pressures and often improve patient comfort and adherence with PAP (1). BPAP is an alternate mode of therapy in which inspiratory and expiratory pressures are set independently. Specifically, expiratory pressure (EPAP) is set to eliminate obstruction and maintain

airway patency, while inspiratory pressure (IPAP) is set to increase tidal volume and improve ventilation. Since EPAP is set at least 4 cmH₂O below IPAP, as per AASM protocols, this mode also offers an expiratory pressure relief and can improve patient comfort (1).

Complaints of dryness in the nose, throat, and mouth are commonly due to inadequate humidification or a leak. Rule out the possibility of a leak or poor seal of the mask interface as previously mentioned. If the mask is sealed properly, check the level of heated 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.

If the patient wakes up congested or feels they are being smothered, the humidification may need to be lowered. Note, however, that too much humidification can cause a “rain out” effect (water buildup) in the tubing and/or mask interface. This can be addressed with the use of heated tubing.

If these complaints persist, it is recommended that the technologist:

- Document the interfaces and strategies attempted
- Ensure that documentation is forwarded to the appropriate provider
- Recommend patient discuss issues and further options with their provider

5.0 USE AND CARE OF PAP EQUIPMENT

Patients or caregivers must be educated about the function, care, and maintenance of their equipment. This includes education about the PAP machine, humidifier, hose, interface, and headgear. The use and care of PAP equipment shall include the explanation of parts and assembly, and how and when to clean equipment according to current standards and/or manufacturer recommendations. Discussion of the benefits of PAP therapy, potential problems, and the importance of daily/nightly use of their prescribed therapy, will help with compliance. Patients should also be informed of common complications of PAP that may cause adherence issues and be 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. 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.

6.0 PAP COMPLIANCE

Optimal PAP compliance is obtained when patients and/or caregivers are educated about the patient's sleep disorder, prescribed treatment, and issues that may arise or continue without regular nightly use of PAP therapy. The education process should begin with the primary referring physician, but also requires discussion and reinforcement by the sleep testing facility technical and professional staff as well as the home care agency providing the equipment to the patient. Establishing a care plan for PAP therapy that includes education and cooperation from all care providers is essential for PAP compliance (2,3,4). Troubleshooting and addressing problems related to PAP use, managing side effects, and utilizing methods to increase PAP adherence, should be an integral part of patient follow-up for patients using PAP, particularly in the first week(s) of therapy (2,3,4).

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

- Inadequate patient education
 - Interface difficulties
 - Not using ramp features properly
- Abbreviated titration
- Difficulties falling asleep
 - Lack of desensitization
 - Arousals
 - Claustrophobia/anxiety
 - Airway dryness/irritation
- Difficulty exhaling against the pressure
- Worries about social acceptance

6.1 Patient Compliance Assessment and Strategies

To begin your assessment of compliance issues, it is helpful to determine if the patient is accepting of treatment. As noted above, patients should be educated about their disorder, its severity, and the consequences if not treated.

- **Does the patient understand the consequences of untreated sleep apnea and the benefits of PAP therapy?**

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 tolerable?**
 - 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?
 - Are they a “mouth breather”?

6.1.1 Claustrophobia and Anxiety Issues

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.

6.1.2 Breathing Against Pressure Issues

Difficulty exhaling against the pressure can be alleviated using a variety of techniques. Decreasing the pressure, particularly as the patient is falling asleep, can be accomplished using the ramp function of the PAP device. Assure that the ramp function is set appropriately and show the patient how to reset the ramping function if they wake and have difficulty tolerating the pressure during the night. The use of pressure relief can also be a benefit as can bi-level settings. Auto-titrating PAP (APAP) can also be considered in the management of OSA in CPAP intolerant patients (1).

6.1.3 Temperature and Humidity Issues

Cold, dry, and irritated airways commonly occur in patients using PAP. Increasing humidity with a heated humidifier should be standard for all patients. The interface itself may contribute to airway irritation as well. For example, people with chronic sinus problems may have difficulty using a nasal pillow interface.

It is also useful to discuss details of the patient's home unit and their nightly filling of the humidifier chamber. Patients should be advised to take notice of the water level in the humidifier when they wake in the morning. A dry chamber indicates not enough water or a severe leak, and if the water level in the morning is the same from the night before, the temperature may not be high enough. Too much humidification can cause a "rain out" effect (water buildup) in the tubing and/or mask interface. This can be addressed with the use of heated tubing.

6.1.4 Mouth Breathing Issues

Mouth breathing can also contribute to airway dryness. Habitual or essential mouth breathing can be identified by having the patient demonstrate their ability to breathe through their 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 mouth breathing occurs 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, it is recommended that the patient be switched to a full-face mask.

6.1.5 Equipment Maintenance Issues

Other problems contributing to airway irritation can include the cleanliness of the equipment, particularly the humidifier, the method of cleaning, or the water used in the humidifier. It is important to emphasize that only distilled water must be used in the humidification system. Tap water often contains chlorine and can cause irritation and a burning sensation in the airway. Tap water also contains minerals that, after continued use, will leave a "salty" residue in the chamber. Assure that the patient is not cleaning the mask, tubing, or humidifier with harsh chemicals, and that they are rinsing the equipment thoroughly after cleaning. Changing or cleaning the filter(s) at least monthly will help increase the quality of air the patient receives, and will increase the lifespan of the unit.

6.1.6 Skin Issues

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.

7.0 PAP DESENSITIZATION

PAP desensitization is generally undertaken with patients who are unable to tolerate PAP during a titration. 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 an

in-lab 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. Select an appropriate interface and head gear.
2. Use manufacturers' sizing gauzes to select the proper size interface and head gear.
3. Allow the patient to handle the interface, holding it to their face to assess fit, prior to connecting to the hose or PAP instrument.
4. Connect the hose to the interface and PAP device. Allow the patient to hold the mask to his face, and gradually introduce pressure at 4 cmH₂O. It is important to allow the patient to have control of the interface.
5. Once the patient is comfortable with the interface and breathing with the PAP at a low pressure, turn off the pressure and fit the interface and headgear. Show the patient how to disconnect the hose, and have them recline in a recliner chair or lie supine in the bed.
6. While the patient is reclined or lying down, re-initiate pressure at 4 cmH₂O or where the patient is most comfortable with heated humidity. 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."
7. If the patient is having 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.
8. Once the patient is able to tolerate the lower pressures, inform them that you will gradually increase the pressure. Remind the patient that they can disconnect the hose if the pressure becomes intolerable. This allows the patient to remain in control of the process.
9. Manually verify there are no interface leaks or other issues prior to the beginning of the titration.
10. Increase pressures gradually in 1 cmH₂O increments in a ramping fashion, carefully monitoring patient reaction and tolerance. In general, pressures should be increased to about 8 cmH₂O during the desensitization process.
11. Confirm the unintentional leak is within the manufacturer's guidelines on the device. If necessary, adjust the interface fit or change styles as needed and document any changes. Utilize a chin strap or full face mask if mouth breathing becomes problematic.
12. If the patient is having difficulty tolerating higher pressures, particularly with exhalation, try using pressure relief or changing the mode to BPAP as per lab protocol.
13. Remember to continue positive reinforcement to insure their success. For example, "You are doing well, keep it up!"
14. When the patient is able to tolerate 8 cmH₂O for approximately 15 minutes the desensitization is considered successful, and a PAP titration study can be attempted.
15. At the conclusion of the desensitization procedure, ask the patient to summarize their experience. Document your assessment, as well as the patient's responses. Encourage the patient to continue these strategies during their titration study and at home.
16. If the patient has difficulty with the mask/interface or does not tolerate the desensitization procedure in the sleep clinic or sleep center, the provider may consider sending the patient home with the mask/interface to continue the process for a period of one to two weeks.
 - a. Send the patient home with written instructions for the process to follow at home.
 - b. Instruct the patient to wear the mask in the evening while watching TV until they can tolerate it for at least 30 minutes. Once the mask is tolerated at home, desensitization in the sleep clinic or sleep center can be attempted again.

17. If the patient has difficulty tolerating the pressure, the provider may consider sending the patient home with the PAP equipment to continue the process for a period of one to two weeks. They may include a ramp setting or other comfort settings for improved tolerance.
 - a. Send the patient home with written instructions for the process to follow at home.
 - b. Encourage the patient to practice outside of the sleep period (perhaps while reclining and watching TV in the evening) until they are able to tolerate the pressure at 8 cmH₂O. Encourage the patient to monitor mask/interface fit to ensure minimal leaks.
 - c. Once this is accomplished, the patient can be scheduled for a PAP titration study.

The PAP desensitization process can be challenging since the patient is awake during the procedure. The technologist must be patient, empathetic and encouraging. Explain to the patient that with practice and time most are able to tolerate and benefit from PAP therapy. Desensitization techniques, interface options, pressure relief technology, and humidification go a long way toward assisting them to accept PAP therapy and ultimately achieve PAP compliance (4).

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