AN INTRO TO

CPAP Machines

An introductory guide to CPAP Machines and Alternatives for Sleep Apnea Therapy

Kevin Phillips

- Alaska Sleep Clinic-

TABLE OF CONTENTS

CHAPTER

1

CPAP Therapy

CPAP Therapy:
What is CPAP Used For?

CPAP devices are the most commonly used treatment options for people experiencing breathing problems, most notably of which is obstructive sleep apnea (OSA).

Sufferers of OSA experience cessations in their breathing in which obstructions in the airway cause them to stop breathing for a few seconds at a time throughout the night.

Depending on the severity of one's sleep apnea, sufferers may experience anywhere from 5 to 100 interruptions per hour in their breathing.

These interruptions can lead to a variety of health issues ranging from chronic daytime drowsiness and restless sleep to heart disease and stroke.

CPAP Therapy:
How Does CPAP Work?

Continuous positive airway pressure (CPAP) machines gently blow pressurized air through your airway at a constant pressure to prevent the throat muscles from collapsing into the airway. CPAP machines are very basic, easy to use, and are composed of three major parts:

1. CPAP motor- The CPAP motor is basically a small compressor. It draws in room temperature air, and gently pressurizes it to deliver the perfect amount of air pressure that you need to clear your obstruction. The air intake portion of the machine has a replaceable filter that screens out particulates and impurities. Most newer CPAP machines also have a small water tank that, when turned on, heats up the water to provide moisture to the air you breath in. These built-in humidifiers are ideal for people living in dry or arid climates and those that frequently wake with dryness of the mouth, throat, or nasal cavities. **CPAP motors are extremely quiet** and barely register above a whisper.

CPAP Therapy:
How Does CPAP Work?

2. CPAP Hoses- The hose is simply the delivery device that transports the pressurized air from the motor to the wearer's mask. While most hoses are 6 feet in length, the diameter of the hoses can be different depending on the machine that one uses. Most hoses are now heated to reduce water condensation accumulation caused by the humidifiers.

3. CPAP Mask- CPAP masks come in all shapes and sizes, because not every individual will feel comfortable wearing the same masks as others. While sizes and shapes may vary to fit different shaped faces**, there are typically three mask type variations to choose from: nasal pillows, nasal masks, and full face masks**. Finding the right mask for your personal level of comfort is the most important part of CPAP compliance.

A patient using a CPAP machine

Photo: rmnoa357/Shutterstock

CPAP Therapy:

Getting Setup with a CPAP Device

The first step in getting CPAP therapy is to have a sleep study (polysomnogram) performed at a sleep clinic. The results of a sleep study will inform your sleep specialist as to the severity of your condition and best treatment options.

If a CPAP machine is determined to be the best option, you will likely have to have a follow-up sleep titration study in which you will sleep at a sleep clinic overnight while wearing various CPAP masks and using a few different machines that will be specifically calibrated to the air pressure needed to clear your airway blockage without causing any disturbance or discomfort to your sleep.

You may also qualify to have a Home Sleep Test (HST) performed to determine the severity of your sleep apnea. Home sleep tests are issued to patients who, through a pre-screening process, are more than likely to have obstructive sleep apnea and simply need to determine the severity. HST's are more affordable than polysomnograms, but don't have as many capabilities.

CPAP Therapy:
Results from CPAP Use

Those who begin using their CPAP devices, often begin to experience immediate positive results including:

- Elimination of snoring and breathing obstructions.
- Improvement in quality of nightly sleep.
- Prevention or reversal of serious health conditions such as cardiovascular diseases and stroke.
- Lower blood pressure both during the day and at night.
- Increased alertness during the day.
- Significant decrease of daytime drowsiness.

CHAPTER

2

CPAP Machines and Equipment

CPAP Machines:

Where to Get Your Device

While there are many online vendors selling CPAP machines, not all of them may be a trusted or reputable CPAP supply retailer. It's easy to get lured in by their cheap prices, but more difficult to know whether you are getting a fair deal. It's quite possible that you may be sold a used machine that is outside of warranty or one that may need to be serviced soon after purchase. If you choose to go ahead and purchase your machine online, make sure that the retailer you are purchasing from has a certified respiratory therapist to help guide you through your selection process.

Your best option for purchasing a CPAP machine (especially if it is your first one) is to go through the sleep clinic that performed your sleep study. Many sleep clinics will have a durable medical equipment (DME) technician on staff to walk you through the buying process. A knowledgeable DME technician can help you find the best machine for your price range, get you fitted with masks, and give you information on how to use and maintain your CPAP machine. Many clinics offer free mask trials while you're finding the right comfort fit, machine trials to allow you to sample the various CPAP machines, and warranty services to not only help you get your machine repaired, but offer you a loaner machine while you wait for yours to be fixed.

CPAP Machines:

10 Features to Consider

1. **Mask selection**. Finding the perfect mask is the most important aspect of CPAP use compliance. There are a variety of masks to choose from which we will discuss later in the book. See Chapter 3.

2. **Noise.** While almost all CPAP machines today are made whisper quiet (below 30 db.), some are quieter than others. If sound is your issue, make sure to check the decibel levels of each machine.

3. **Humidifier**. Having air continuously blown into your airways can lead to dry, irritated airways. That's why most CPAP machines now come with an added humidifier rather than as an optional feature. Some machines come with built-in humidifiers while others come as a separate, connecting unit. Having a humidifier that can separate from the machine can come in handy for travel when you don't want to take the entire machine.

CPAP Machines:

10 Features to Consider

4. **Portability.** If you frequently travel, having a small, lightweight, compact machine may be your best option, or you may want to buy a separate machine for travel purposes. It's also important to check to see if your machine comes with multiple plug-in adapters such as a DC power supply or international plugs, as well as an option to use a portable battery.

5. **Ramp.** When you first put your CPAP mask on at night and turn the machine on, it may be difficult to adapt to the immediate airflow of your pressure settings, especially if you have moderate to severe sleep apnea, which requires relatively high pressure. A ramp is a comfort feature that allows your machine to gradually build-up to the prescribed pressure, making compliance much easier.

CPAP Machines:

10 Features to Consider

6. **Exhalation pressure relief.** This feature makes it easier to exhale your breath against the incoming pressurized air, making breathing feel more normal and easier. The machine maintains the prescribed air pressure settings during inhalation, but scales them back a bit during exhalation so you don't feel like you're fighting against the incoming air.

7. **Heated tubing.** A small heating coil is placed in the tubing that connects the machine to the mask, and helps keep the air in the tube at a constant temperature. This feature aids in reducing condensation build-up in the tube and mask, which can lead to moisture dripping onto one's face.

8. **Mask On/Off Alert**. Some sleepers toss and turn during sleep. When this happens their mask may come off or lose its seal. Some machines have an alert that beeps to wake the sleeper, reminding them that their mask has come loose.

CPAP Machines:

10 Features to Consider

9. **Leak Compensation.** If your mask is leaking for any reason, machines with this feature can compensate by increasing the airflow to ensure that you are still getting the prescribed pressure at all times.

10. **Data Recording**. Many machines come with various capabilities of recording data. Some only record information such as how long you used the machine at night, while others are capable of giving much more in-depth information such as: apnea events, hypopnea events, changes in pressure, leak rates, information on snoring, and more. This information can be used to check daily, weekly, or even monthly averages. Many of the devices allow users to view their personal data information, while others are restricted for clinical viewing only.

CHAPTER

3

Alternatives to CPAP Therapy

Alternatives to CPAP

CPAP Doesn’t Work for Everybody

Unfortunately, CPAP use is a therapy and not a cure. In order to get the most out of treatment, patients have to use their CPAP machines on a nightly basis to keep their symptoms from recurring. But what can you do when the therapy you're prescribed is simply intolerable?

One study estimated that **30-50 percent of CPAP users don't like their treatment** and another survey discovered that about half of CPAP patients stopped using their device within 1-3 weeks of use with discomfort from the masks or airflow being the major reason for non-compliance with treatment.

Alternatives to CPAP

8 Options to Choose other than CPAP

1. **Automatic positive airway pressure (APAP) therapy**- A frequent complaint from CPAP users stem from the constant, single-setting air pressure from CPAP machines. Many find the single-setting to be a nuisance as it doesn't always give them the air pressure they need at a given time. APAP therapy deals with this problem by establishing a low range pressure number and a high range pressure number that automatically adjusts as you sleep to give you the ideal pressure at any given moment. Using an algorithm that senses subtle changes in your breathing, an APAP machine can detect such things as spikes in apnea events to raise air pressure, or sense when you roll on your side when a decreased pressure is better suited.

Alternatives to CPAP

8 Options to Choose other than CPAP

2. **Bilevel positive airway pressure (BiPAP) therapy**- Another common complaint about CPAP use is that some users find it difficult, or uncomfortable, to exhale against the constant pressure of a CPAP machine. BiPAP machines solve this problem in that they adjust the pressure of air being delivered depending on whether the patient is inhaling or exhaling. During inhalation, an electronic sensor tells the BiPAP to send more air through the mask to clear obstructions. During exhalation the air pressure is reduced so patients don't feel any pressure resistance to their breathing. BiPAP is best for patients who have high pressure needs or low oxygen levels.

Alternatives to CPAP

8 Options to Choose other than CPAP

3. **CPAP with C-Flex-** C-Flex is similar to BiPAP therapy in that it offers pressure relief as the patient exhales so that they don't feel like they're fighting against the incoming airflow during expiration. However, C-Flex is more of a comfort feature for CPAP machines that only offers pressure relief up to 3 cm, whereas BiPAP pressure relief starts at 4 cm and goes up. For those who need only a little pressure relief, a CPAP with C-Flex might be the right choice.

Alternatives to CPAP

8 Options to Choose other than CPAP

4. **Oral/Dental Devices-** For sufferers of sleep apnea with a mild to low-moderate diagnosis, oral devices such as mandibular advancement devices (MADs) and tongue retaining mouthpieces may be more comfortable solutions.
   - **Mandibular advancement devices**-MADs look similar to sports mouthguards and push the lower jaw down slightly to pull the tongue forward and help keep the airway open. Oftentimes however, MADs don't cure apnea events but merely help reduce one's apnea index number. If the pressure from a CPAP is causing discomfort, MADs can be worn in conjunction with CPAP therapy and can help lower the pressure needs. While there are some over the counter devices available, it is recommended that you get properly fitted for the device by your dentist.
   - **Tongue-retaining mouthpieces-** Similar in concept to MADs, tongue-retaining mouthpieces are worn orally and adjust the position of the tongue during sleep. Instead of holding the jaw in place, this device is placed on the tip of the user's tongue and rests on his lips.

Alternatives to CPAP

8 Options to Choose other than CPAP

5. **Adenotonsillectomy-** This surgical procedure includes the removal of the patient's adenoids and often the tonsils as well. These lymphatic tissues are located in the area where the nasal passages meet the throat. When these tissues become inflamed, they can cause blockage that can lead to obstructed breathing. This surgery is often the first-line of treatment in children with OSA, although it has also been proven effective in some adults.
6. **Nasal surgery-** For OSA sufferers whose symptoms are caused by a deviated septum, enlarged turbinate tissues, or a collapsed or narrowed nasal valve, nasal surgery can often improve one's breathing, and reduce obstructive events. In some patients with mild sleep apnea, surgery may even eliminate their breathing difficulty symptoms. However, in patients with moderate to severe sleep apnea, nasal surgery is usually performed to improve CPAP compliance and comfort by reducing the air pressure levels needed to clear obstructions.

Alternatives to CPAP

8 Options to Choose other than CPAP

7. **Maxillomandibular Advancement (MMA) surgery-** In this surgery, upper and lower parts of the jawbone are moved forward to create an enlarged space behind the tongue and soft palate, making obstructions less likely.

8. **Tracheostomy-** In the most extreme cases of obstructive sleep apnea, where other treatments and surgeries have failed to produce positive results, a doctor may recommend a tracheostomy. In this procedure, a surgeon creates a permanent opening in the windpipe and inserts a breathing tube. A valve on the breathing tube allows it to be closed during the day for normal breathing and speaking, and opened at night so air can enter at a point below the obstruction, thus bypassing it.

CHAPTER

4

All About CPAP Masks

CPAP Masks

Finding a Mask that Works

Finding the right mask is crucial to CPAP therapy. With so many different mask styles, shapes, and sizes, choosing the mask that works best for you can be a little daunting at first as there's no "miracle mask" that is best for all patients. What it all really boils down to is finding a mask that suits your own individual breathing needs, sleep habits, and comfort levels.

There are 3 main categories of masks: nasal pillows, nasal masks, and full face masks. Each style has it's own benefits and drawbacks that we will explore.

CPAP Masks

Nasal Pillows

Nasal pillow masks are among the most popular mask choices for CPAP users because of their minimal design. Nasal pillows are the smallest of the CPAP masks and rest on the user's upper lip as it blows pressurized air through two soft nasal tubes that insert into the nostrils, and is secured by straps that go around the head.

CPAP Masks

Nasal Pillows

Benefits of Nasal Pillows:

- The lightweight and minimal design is ideal for patients suffering from claustrophobia or those that simply feel uncomfortable with too much material touching their face.
- Optimal for wearers who like to read or watch TV before bedtime, as it offers a better field of vision than many of the other mask types.
- Allows user to wear their glasses as there's no material covering the bridge of the nose.
- The direct airflow into the nasal passages reduce air leakage.
- Good for active sleepers who toss and turn a lot.
- Works best for users who have a lot of facial hair that may cause leakage in other mask types.

CPAP Masks

Nasal Pillows

Drawbacks of Nasal Pillows:

- Often not ideal for patients with higher-pressure needs, as the airflow is very direct and may cause discomfort at higher pressure settings.
- Some users find the direct air pressure leads to higher incidences of nasal dryness, and in some cases, even nose bleeds.
- Not ideal for mouth-breathers. If you're not accustomed to breathing through your nose, using a nasal pillow may feel unnatural or uncomfortable. Although, if you're a mouth-breather and really want to wear a nasal pillow, try using it in conjunction with a chin-strap.

CPAP Masks

Nasal Masks

Nasal masks are triangular in shape and fit over the nose, covering the areas from the bridge of the nose down to the upper lip. They are popular among CPAP wearers because of the wide range of sizes and fits, making finding a perfect mask for any user very likely.

CPAP Masks

Nasal Masks

Benefits of Nasal Masks:

- More natural airflow than nasal pillows as the delivered pressure isn't as direct.
- Better for higher-pressure settings than nasal pillows.
- Many different styles cater to a wide range of facial structures and features.
- If you move around a lot in your sleep or sleep on your side, the suction of the nasal mask helps keep it securely in place.

CPAP Masks

Nasal Masks

Drawbacks of Nasal Masks:

- Much like nasal pillows, nasal masks are not ideal for mouth-breathers unless accompanied by a chin-strap to keep the jaw closed.
- Some CPAP wearers complain about irritation caused by the pressure of the mask resting on the bridge of the nose or the forehead supports of some models.
- Not ideal for patients who frequently experience allergies or colds that cause blockage of the sinuses.
- Not recommended for patients who have difficulty breathing through the nose from medical conditions such as a deviated septum, enlarged turbinates, or a collapsed or narrowed nasal valve.

CPAP Masks

Full Face Masks

CPAP full face masks cover the nose and mouth and all, or part, of the face with side straps that keep the mask in place. Some hybrid face masks cover the mouth but also have nasal prongs that fit into the nostrils like a nasal pillow.

CPAP Masks

Full Face Masks

Benefits of Full Face Masks:

- Face masks are ideal for mouth-breathers and those that haven't worked well with the nasal mask/chinstrap combination.
- Ideal for patients who that have nasal obstructions or frequent congestion due to allergies or cold symptoms.
- Oddly enough, some claustrophobic patients have preferred the full face mask that covers the entire facial area, as the mask only touches the outsides of the face. Whereas the nasal pillows and nasal masks touch the upper lip and/or the bridge of the nose.
- Works well for very high CPAP pressure settings because the wide surface area of the mask makes it feel as if the pressure is more tolerable and less direct than with other masks.
- Works well for those that sleep on their back as the supine position is best for an optimal air seal. However, the added straps and support help keep the mask in place for restless sleepers.

CPAP Masks

Full Face Masks

Drawbacks of Nasal Masks:

- Because of the larger surface area, there is a higher chance of air leakage.
- Some users complain of air leakage near the top of the mask, causing dry, irritated eyes.
- Most claustrophobic patients can't tolerate the extra material and weight of the full face mask, although there are some exceptions.
- Full face masks make it difficult to read or watch TV in bed or wear glasses.
- If you're a stomach sleeper, the bulk of the mask will make it difficult to sleep comfortably on your abdomen.

CPAP Masks

Things to Consider When Choosing a Mask

- **Size, fit, and comfort** are the most import considerations when choosing a CPAP mask. If the mask doesn't fit, isn't comfortable, or doesn't meet your breathing needs, it's not likely that you will be compliant with CPAP therapy. Take the time to go over the best mask for you with your DME tech, and don't be afraid if you change your mind later and want to try a different mask.
- Make sure to **tell your DME tech if you are an active sleeper** so that you get the most secure mask possible.
- Tell your DME tech if you are claustrophobic or if there are areas of your face that are easily irritated.
- If you have facial hair, it's important to find a mask type that won't leak due to the uneven surface area.
- If you read, watch TV, or wear glasses in bed, find a mask that allows you the best field of vision so as not to disrupt your nightly routine.

CPAP Masks

Things to Consider When Choosing a Mask

- If you breathe through your mouth, you may need a full face mask or a nasal pillow/mask in conjunction with chinstraps.
- As there are many different cushion types (gel, silicone, foam, cloth etc.), find which is most comfortable for you.
- Check to see if the mask you choose has replaceable cushion parts.

CHAPTER

5

How to Care for Your CPAP Equipment

Caring for Equipment

Why You should Maintain Your CPAP Equipment

One of the most important factors in maintaining CPAP compliance is taking proper care of your CPAP equipment. In order to have successful CPAP therapy, you must be willing to make your treatment a priority in your life, and that means regularly cleaning and maintaining your CPAP equipment. Fortunately, taking proper care of your equipment is pretty easy, and not very time consuming. With a little adjustment to your regular morning routine, your device and accessories will be working at 100% efficiency to get you that much needed sleep you've been longing for.

CPAP User Cleaning Mask Cushions

Caring for Equipment

CPAP Humidifier Cleaning and Replacement

Nearly all current CPAP machines now come stock with a heated humidification system that helps cut down on morning dry mouth as well as keeping your nasal turbinates from drying out and becoming irritated and inflamed. However, the **humidification chamber needs to be cleaned out daily** to prevent bacteria build-up as well as calcification. Here's how:

- Remove chamber from humidifier carefully so water doesn't enter your CPAP machine.
- Open chamber and wash with warm, soapy water.
- Rinse well with water and allow to dry on a clean cloth or paper towel out of direct sunlight.
- Fill with distilled or sterile water. D**o not use tap water** as it may contain minerals and chemicals that can damage components of the machine. It is also not recommended to use filtered water (i.e. through a Brita filter) for the same reasons.

Caring for Equipment

CPAP Humidifier Cleaning and Replacement

- Once a week the humidifier chamber should be soaked in a solution of 1 part white vinegar to 3 parts water for approximately 15-20 minutes before rinsing thoroughly with distilled water.
- Some humidifier chambers are dishwasher safe, but make sure to check your CPAP machine's manual before cleaning in a dishwasher.
- Humidifier chambers should be replaced every 6 months or as needed.

Caring for Equipment

CPAP Mask Cleaning and Replacement

Most CPAP mask cushions are made of silicone, a gentle, non-irritating material. However, while silicone is a very comfortable material for masks, it doesn't have a very long lifespan, and without proper care can breakdown quicker than expected. Therefore, cleaning your CPAP mask is crucial in making it efficient as possible. Here's some tips on CPAP mask cleaning and replacement:

- Wash mask daily with warm water and mild, non-fragrant soap, or purchase CPAP mask specific wipes and detergents.
- Rinse with water and allow to air dry on a clean cloth or paper towel out of direct sunlight.
- Before using mask at night, wash your face thoroughly and don't use facial moisturizers. **Facial oils and moisturizers can breakdown the silicone faster.**

Caring for Equipment

CPAP Mask Cleaning and Replacement

- Once a week soak mask in solution of 1 part white vinegar 3 parts water before rinsing in distilled water.
- Headgear and chinstraps should be washed as needed by hand using warm soapy water, rinsed well, and air dried. **Do not place headgear or chinstraps in washing machine or dryer.**
- For replacement schedules of CPAP masks you should check both your manufacturer's recommendations and your insurance allowance. However, for most masks it is recommended that you replace the cushions 1-2 times per month, and the mask every 3-6 months.
- CPAP tubing should be cleaned weekly in a sink of warm, soapy water, rinsed well, and left to hang-dry out of direct sunlight.

Caring for Equipment

General Maintenance and Cleaning Tips

- Make your CPAP equipment cleaning part of your morning routine, allowing the equipment ample time to dry during the day.
- Keep machine and accessories out of direct sunlight to avoid damaging them.
- Never use bleach to clean accessories.
- Other machine accessories such as power cords and data cards may need to be replaced due to equipment malfunctions.
- Place machine on a level surface away from objects such as curtains that may interfere with the air intake.
- Always use distilled or sterile water when cleaning components.
- Keep track of when you should order replacement parts for your mask and accessories so that you always get the most out of your therapy.

Conclusion

What to do Next

Talk with your primary care physician, local sleep clinic, or your DME provider about your CPAP options. Always make sure that everything is being done to meet your comfort needs with your therapy.

Successful sleep apnea treatment is 100% reliant on patient compliance, and if you're not comfortable with your mask or equipment, chances are you will discontinue therapy, which can be hazardous to your health.