

# WITH OSA DIAGNOSES RISING, CPAP MANUFACTURERS DESIGN MORE PATIENT-FRIENDLY DEVICES

*By Stephanie Richardson*

**W**hy did the sleep physician cross the road? To administer 18 million CPAP treatments on the other side. In theory, that's how many continuous positive airway pressure devices would be puffing along every night if each American diagnosed with obstructive sleep apnea plugged into one.

Unfortunately, many sleep apnea patients continue to struggle with compliance. From loud devices to units too big for the nightstand, there is no shortage of excuses for why patients don't use their CPAP. Luckily, CPAP manufacturers have risen to the challenge of developing devices to fit any patient's need and comfort level.

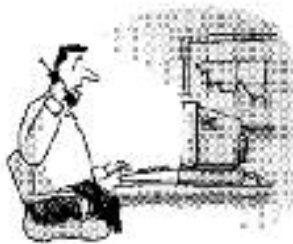
Read on to learn about some of the most advanced CPAP devices that you can recommend to your patients and for use in your sleep centers.

### **Auto-adjusting devices**

Automatic positive airway pressure (APAP) therapy is designed to give patients the minimum pressure necessary at any given time, as well as the ability to automatically change that pressure as the patient's needs change.

All APAP devices are different, each of them relying on different algorithms. One of the more advanced APAP models improves therapy by reducing pressure-related side effects such as dry nose, sinus congestion, sore throat and sleep disturbance. In fact, researchers discovered that sleep apnea patients using pressures over 10 cmH<sub>2</sub>O used APAP more often and longer than traditional CPAP. This same device has been shown to provide therapy at pressures 37 percent lower than standard CPAP.

APAP devices monitor breathing on a breath-by-breath basis, delivering only the pressure a patient needs at the time they need it. These devices act pre-emptively by monitoring a patient's inspi-



**"If the option key is my only option,  
what are my other options?"**

ratory flow-time curve. A flattening curve usually precedes an obstruction of the upper airway.

By monitoring and responding to the flow-time curve, APAP devices reduce the number of arousals and respiratory events, leading to better sleep quality. Studies have suggested that using the flow-time curve is preferable to responding to apneas and hypopneas directly. Further, these studies recommend using the flow-time curve to achieve optimal pressure during titration.

### **Proportional PAP**

A frequent complaint of conventional CPAP users is the feeling of discomfort they experience when trying to fully exhale against CPAP pressure. Often, this results in frequent awakenings that result in sleep fragmentation and discontinued use. Proportional positive airway pressure, also referred to as "flex" technology, has had quite an impact therapy by improving compliance by decreasing the cumulative pressure during exhalation.

Proportional PAP is titrated the same way as standard CPAP, but it monitors a patient's airflow during exhalation and reduces expiratory pressure proportional to expiratory flow. This relief pressure depends on a patient's air flow and varies on each breath. However, to ensure the patient's airway has the best possible support, the machine returns to the prescribed CPAP pressure before the end of expiration and beginning of inspiration.

Clinicians at Lehigh Valley Hospital (Allentown, Pa.) studied proportional PAP in 30 patients requiring CPAP therapy. They determined that proportional PAP produced statistically significant improvements in sleep efficiency as compared to conventional CPAP.

Additionally, a study published in *Chest* reported OSA patients using proportional PAP showed a 1 hour and 42 minute increase in nightly use after three months compared with patients using conventional CPAP for that same time period. Additionally, patients using this device were 3.8 times more likely to comply with therapy for six hours per night after six months of use.

### **Expiratory Pressure Relief**

One of the most recent advances for enhancing CPAP compliance is expiratory pressure relief, or EPR. This CPAP

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alternative provides various options for improving patient comfort without compromising the effectiveness of therapy.

EPR operates by detecting the beginning of exhalation and reducing the device's motor speed to drop pressure when the patient exhales. Patients can choose from one of three pressures – 1 cm H<sub>2</sub>O, 2 cmH<sub>2</sub>O and 3 cm H<sub>2</sub>O – to determine the best comfort level for them.

In addition to the multiple pressures, devices featuring EPR have other options to enhance therapy. EPR's ramping option allows therapists to control patient access to EPR by restricting its use to the ramp period only. This way, patients feel the comfort of EPR in the early stages of sleep when they are alert and breathing against CPAP pressure is the most cumbersome. When the ramping period ends, pressure reverts to the prescribed CPAP level. EPR also can be set to run during an entire night's sleep.

EPR also features an event detection circuit, which is a back-up feature of the EPR algorithm. When a patient changes his or her sleeping position or sleep stage, sudden events can occur without the usual preceding flow limitation or snoring. When these unpredicted events occur, EPR suspends instantaneously, and pressure returns to the set CPAP. EPR remains stopped until the event concludes and normal breathing resumes.

EPR's final distinctive feature is a time-out function. If a patient does not exhale for 15 seconds or more, EPR will suspend. Here, the device also reverts to the prescribed pressure, and it remains until the device detects the patients next inspiration.

#### **Bi-level therapy**

Unlike CPAP, bi-level PAP builds to a higher pressure when a patient inhales and decreases to a lower pressure when he or she exhales. The goal of this treatment is to boost the weak breathing pattern of central sleep apnea. Some bi-level PAP devices can be set to automatically deliver a breath if the device detects a patient hasn't taken a breath after a fixed period of time.

Several versions of bi-level PAP exist, and they use different methods for cycling between inhalation and exhalation. Bi-level machines provide the most flexibility with regard to exhalation pressure relief. A bi-level CPAP system delivers two different positive pressure levels -- an inspiratory positive airway pressure, or IPAP, and an expiratory positive airway pressure, or EPAP. The difference between these two pressure levels is commonly referred to as the pressure support.

This type of pressure relief is similar to pressure relief technologies such as EPR and proportional PAP. The primary difference is that the pressure support on a bi-level device can be much higher. The difference between the IPAP and EPAP on a bi-level machine can be much greater than the difference patients might experience using one EPR or proportional PAP.

The most sophisticated bi-level machines have spontaneous and timed modes. They deliver a machine-triggered breath if the CPAP user does not breathe in a set period of time. These and other bi-level devices ensure that the CPAP user receives a minimum number of breaths per minute.

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