Sleeping (and Breathing) Better: 30 Years of Progress

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Photo courtesy of Sam Chang, ResMed.

First CPAP, 1988-1989, Sullivan branding

Photo courtesy of Sam Chang, ResMed.

S9 Elite™ CPAP, 2010

BiPAP® ST, 1990

BiPAP® AVAPS™, 2007

Thirty years ago, the April 18, 1981, issue of *Lancet,* a renowned British medical journal, contained an article entitled "Reversal of obstructive sleep apnoea by continuous positive airway pressure applied through the nares."[1] Written by lead physician and researcher Colin E. Sullivan with his colleagues in Sydney, Australia, it described the first use of what we now know as continuous positive airway pressure (CPAP) therapy to treat obstructive sleep apnea (OSA) noninvasively. Before CPAP, the treatment for OSA was an invasive tracheostomy.

In OSA, people experience a cessation of breathing (apnea) during sleep because the muscles of the throat collapse to block the airway. The CPAP therapy works by forcing a continuous flow of air down the airways to keep them open during sleep to prevent episodes of apnea. The individual wears a nasal, full or partial face mask, or nasal pillows connected by tubing to a CPAP unit.

Beginning in the 1950s, sleep medicine pioneers Nathaniel Kleitman, Elliot Weitzman, William Dement and Christian Guilleminault discovered and identified sleep stages that became the basis for understanding the influence and effects of sleep on breathing in the late 1970s.[2] (The Association of Sleep Disorders Centers was founded in 1976.)[3]

Sullivan expanded on those discoveries and characterized the pathophysiology of adult sleep apnea, later studying the use of noninvasive ventilation during sleep to manage respiratory failure. He helped develop the technology of CPAP and a variety of mask interfaces for ResMed,[4] established and headquartered in Australia in 1989.

Taking CPAP a step further, Mark Sanders and Nancy Kern published an article in *CHEST*[5] in 1990 describing the use of noninvasive ventilation at two different levels of pressure: higher for inspiration, lower for expiration. Commercially developed by Respironics,[6] Inc., in Pittsburgh, Pennsylvania, this method of bilevel positive airway pressure was patented as BiPAP®. Although originally intended for people with OSA, this form of bilevel ventilation became widely used by people who needed nighttime ventilatory assistance. It offered an alternative to the volume and pressure ventilators that have alarms and more safety features for 24-hour use and are more expensive. Many companies in many countries around the world have since developed their own versions of the original devices.[7] ResMed later developed its own bilevel units.

CPAP and bilevel use has skyrocketed in the past 30 years. CPAP's rise can be attributed to the high incidence of OSA in the general population, estimated at 12 percent. Auto-titrating, or automatic, positive airway pressure (APAP) units have been developed that are more sensitive in adjusting to individual breaths. The use of bilevel units as a first step in treatment that improves sleep and breathing in people with neuromuscular disorders such as ALS, muscular dystrophy and post-polio, and in children with CCHS, has gained widespread acceptance. The availability of bilevel units in developing countries that cannot afford volume or pressure control

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ventilators for home care has also contributed to its increasing use.

It is not an understatement that CPAP and bilevel units have improved the sleep and breathing of countless thousands of people and, in the process, have saved lives. ▲

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