Obstructive Sleep Apnea is a condition in which the soft tissues of the oropharynx relax while the individual is asleep and block off the airways for at least ten seconds. This can be a very dangerous situation if the equipment is for an individual’s medical needs. One such machine that can be affected by a power outage is a Continuous Positive Airway Pressure (CPAP) machine that is used to treat obstructive sleep apnea (OSA). Patients with OSA use these machines at home as they sleep and need to be alerted if their CPAP machine malfunctions. Most CPAP machines are electrically powered and therefore impacted by power failures.

**Background:**

Continuous positive airway pressure (CPAP) machines are commonly used to treat obstructive sleep apnea. The National Sleep Foundation estimates that there are 18 million cases of adult OSA; any of these individuals is at risk for high blood pressure, arrhythmias, heart attacks, and strokes. When CPAP is not being used, patients are at risk for fragmentation of sleep.

The purpose of this bench study was to determine the response of four of the most common home CPAP machines during simulated one-minute and fifteen-minute power failures.

**METHODOLOGY AND DATA COLLECTION:**

**PURPOSE:**

Therapists and patients should be attentive to the response of home CPAP machines during simulated power failures. We evaluated the response of four CPAP machines: ResMed AirSense™ 10 AutoSet™, ResMed S9 AutoSet™ for Her, Philips Respironics DreamStation, and Fisher & Paykel ICON™. When tested, each CPAP machine was plugged into a General Electric power strip and allowed for simulated breathing and placement of a face mask. A Respironics AF541 face mask HR 1101 was attached with Hudson Corr-a-flex II 22mm tubing to an anatomical model that was placed on the CPAP machine display. The model was turned on. We noted the response of the CPAP machine to the power failure and to the CPAP level and delivery consistency. The switch on the power strip was confirmed by the mask fit test or operator confirmation of minimal to no leak. The tubing was then attached to the corresponding manufacturer-specific tubing. No humidification was used. Each machine was tested with different lung parameters: Resistance 3 cmH2O/L/sec, Compliance 60 ml/cmH20, Rate 12 BPM, Amplitude 10 cmH20, Effort Slope 5, Percent Inhale 33%, Target Volume 500 ml. The following lung parameters were entered: Resistance 3 cmH2O/L/sec, Compliance 60 ml/cmH20, Rate 12 BPM, Amplitude 10 cmH20, Effort Slope 5, Percent Inhale 33%, Target Volume 500 ml.

**RESULTS:**

This data is significant because it suggests that respiratory therapists, patients, and their families need to be informed if their CPAP malfunctions. Most CPAP machines are electrically powered and therefore impacted by power outages. The purpose of this bench study was to determine the response of four of the most common home CPAP machines during simulated one-minute and fifteen-minute power failures.

**CONCLUSIONS:**

Our study found that all four CPAP machines, the ResMed AirSense™ 10 AutoSet™, ResMed S9 AutoSet™ for Her, Philips Respironics DreamStation, and Fisher & Paykel ICON™, responded with audible or visible alerts. When power was restored the ResMed AirSense™ and Philips Respironics DreamStation were set to pressure to confirm CPAP level and delivery consistency. The switch on the power strip was confirmed by the mask fit test or operator confirmation of minimal to no leak. Fisher & Paykel ICON™ + Auto and ResMed S9 AutoSet™ for Her had audible and visible alerts. When power was restored the ResMed AirSense™ and Philips Respironics DreamStation were set to pressure to confirm CPAP level and delivery consistency. The switch on the power strip was confirmed by the mask fit test or operator confirmation of minimal to no leak. The Philips Respironics DreamStation was preset at 4. We then watched until each CPAP machine delivered a consistent tidal volume and pressure. The CPAP machine was deemed fully functional, a power outage was simulated by turning off the power strip for one and fifteen minutes. We noted the response of the CPAP machine to the power failure and to the CPAP level and delivery consistency. The switch on the power strip was confirmed by the mask fit test or operator confirmation of minimal to no leak. The Philips Respironics DreamStation was preset at 4. We then watched until each CPAP machine delivered a consistent tidal volume and pressure. The CPAP machine was deemed fully functional.

**REFERENCES:**


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