

AirCurve™ 10 VAuto BiPAP machine

White Paper
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Executive Summary

The purpose of this white paper is to demonstrate the immense value of having the AirCurve™ 10 VAuto BiPAP machine as part of the hospital's arsenal to treat inpatients, how this unit would elevate patient care, improve patient outcomes, shorten hospital stays, ~~as well as~~ free up critical care machines meant for emergency use.

Obstructive sleep apnea and obesity are common comorbidities in inpatients, affecting over 5.4 million people [1] and 8.3 million people, [2] respectively, ~~in Canada~~. If left untreated, ~~OSA~~ can lead to obesity hypoventilation syndrome, heart failure, and ~~in~~ severe cases, death. The current wait time for an urgent sleep study is 3-6 months, and these can only be done as an outpatient.

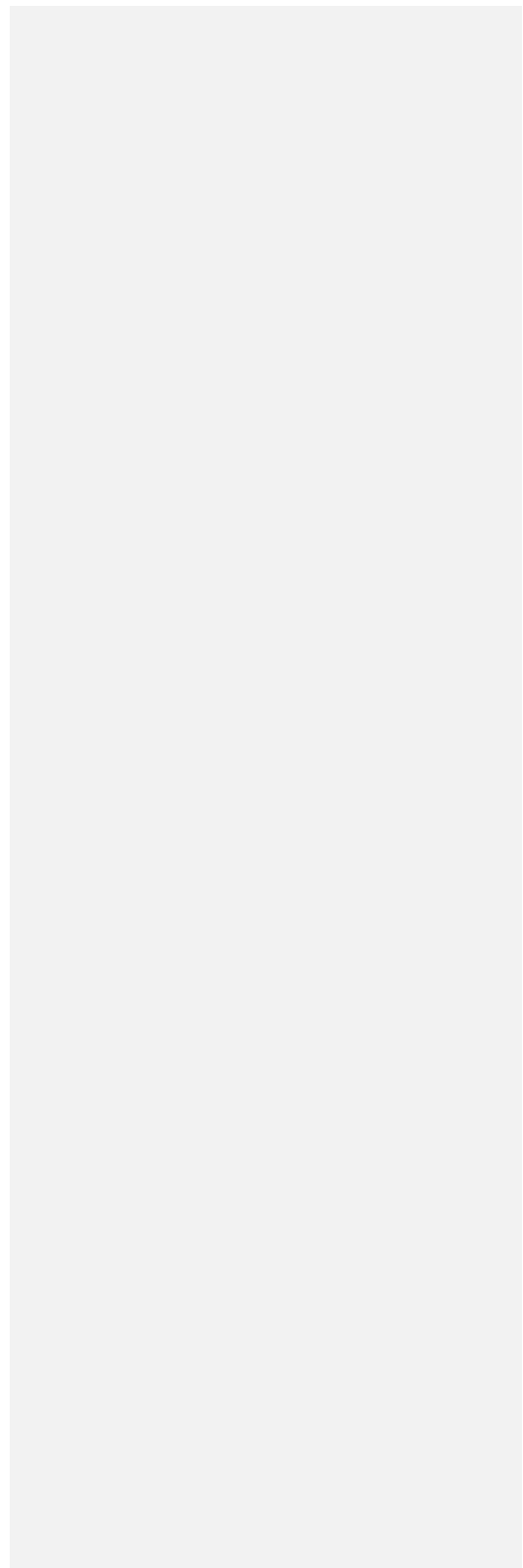
As its name implies, the AirCurve™ 10 VAuto machine is capable of automatically detecting what pressures a patient requires, ~~can give~~ instant treatment, has multiple modes to suit each patient, ~~has~~ easily accessible data for clinicians, is quiet and comfortable for patients to use, and frees up a rescue BiPAP machine for use in emergency situations.

The AirCurve™ 10 VAuto is a compact, sophisticated, and effective machine that would be an extremely powerful tool to treat the growing number of increasingly sick inpatients suffering from sleep-disordered breathing. It would improve patient compliance, patient outcomes, and ultimately shorten patient stays.

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Glossary

Sleep apnea: ~~A disorder that happens when~~ a person stops breathing in their sleep, either because something is obstructing airflow, or because the brain is not sending signals to the respiratory muscles to move.

Hypopnea: A reduction in airflow, but unlike an apnea, it does not obstruct entirely.

Obstructive sleep apnea: ~~Sleep~~ A type of sleep apnea specifically caused by total obstruction to airflow, i.e.: when large airways collapse during sleep, or the tongue blocks the airway. ~~Obstructive sleep apnea is very~~ common in men.

Central sleep apnea: ~~A type of sleep apnea where~~ a person in their sleep stops breathing specifically because their brain does not send signals to the respiratory muscles to contract. ~~Central sleep apnea is sometimes~~ caused by a brainstem injury.

AHI: Apnea Hypopnea Index: An index of how many times airflow is reduced or stopped entirely for an hour. A normal level is categorized by <5 events per hour.

Mild sleep apnea is categorized by 5-15 events per hour.

Moderate sleep apnea is categorized by 15-30 events per hour.

Severe sleep apnea is categorized by >30 events per hour.

CPAP: Continuous Positive Airway Pressure ~~is a~~ machine that delivers continuous pressure as a person exhales, keeping the airways open. This ensures that no obstructive apneas occur. It is measured in centimeters of water.

BiPAP: Bi-Level Positive Airway Pressure ~~is a machine that is used for~~ more complex cases of sleep apnea, or, when one level of pressure is not enough, two levels of pressure are required. Expiratory Positive Airway Pressure (**EPAP**) is equivalent to CPAP during the BiPAP mode. Inspiratory Positive Airway Pressure (**IPAP**) is airway pressure delivered upon inspiration. Both are measured in centimeters of water.

Auto-BiPAP: Automatic Bi-Level Positive Airway Pressure ~~is a~~ machine that is capable of automatically detecting what levels of pressure a person requires after wearing the machine continuously for several hours.

Introduction

The purpose of this white paper is to recommend Brockville General Hospital adopt and deploy the AirCurve™ 10 VAuto as ~~a tool one of its tools~~ to treat inpatients.

Due to an increasingly sick and aging population, hospitalizations and ~~the~~ average length of stay ~~of patients~~ are on the rise. Obstructive sleep apnea (OSA) and obesity are common comorbidities, affecting more than an estimated 22% [1] and 30% [3] of adults, respectively, ~~in Canada~~. Untreated OSA can lead to obesity hypoventilation syndrome, irregular heartbeats, devastating effects on the cardiovascular system, and increased mortality [4]. Furthermore, wait times for outpatient sleep studies average 3 months for urgent cases. (placeholder note to try to find source to credit)

This white paper will cover:

- The effects and repercussions of untreated OSA
- The current state of the hospital, and
- The tangible benefits of having the AirCurve™ 10 VAuto for ~~in-hospital~~ use within hospitals

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Heading: The Dangers of Interrupted Sleep

Obstructive Sleep Apnea is the most common sleeping disorder, affecting an estimated 1-5 billion people worldwide [5]. OSA is caused by obstruction, and is characterized by episodes of partial or complete blockage of airflow during sleep, caused by obstruction [6]. The lack of airflow causes not only interruptions of sleep, but also a lowered amount of oxygen in the blood. Events are measured in a hypopnea index, referring to how many hypopneas or apneas happen during sleep. Mild is characterized by 5-15 events per hour, moderate 15-30, and severe >30.

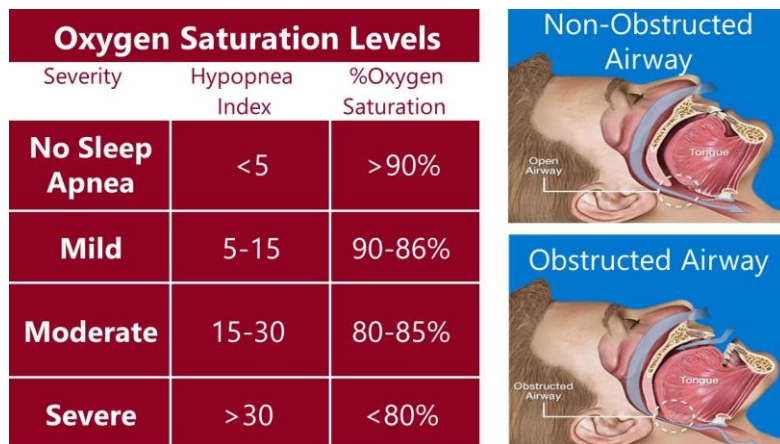


Figure 1: Correlation between Hypopnea Index and Oxygen Saturations. [7]

Obstructive sleep apnea has been associated with increased risk of hypertension, type II diabetes, stroke, coronary artery disease, increased risk of heart failure, and in severe untreated cases, death. Studies have shown that moderate and severe sleep apnea is associated with a large increased risk of mortality, not only from cardiovascular causes, but others as well [8].

Obesity is a common finding in obstructive sleep apnea, and if both are left untreated, can lead to a disease called Obesity Hypoventilation Syndrome, or Pickwickian Syndrome (9). This disease is characterized by dangerously high levels of carbon dioxide in the blood, and dangerously low levels of oxygen in the blood, causing the body to breathe abnormally slow. The life expectancy of those with OHS is poor, with a mortality rate of over 20% in an 18-month period.

Hospital Statistics

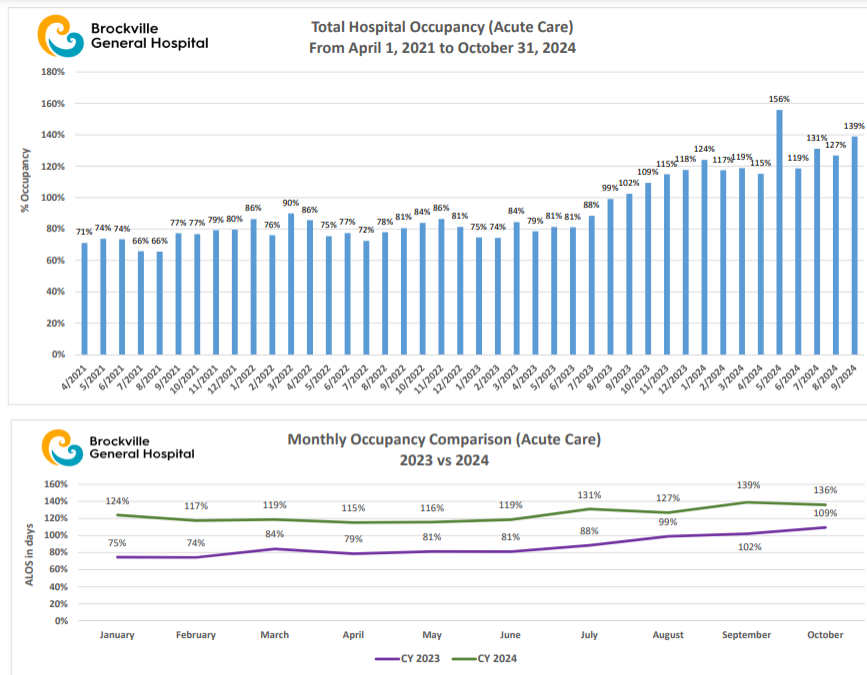


Figure 2: Total Hospital Occupancy (Acute Care) from April 1,2021 to October 31, 2024 [10]

Both hospitalizations and the average length of hospital stays continue to increase, putting strain on ~~the hospitals~~ and the medical system. Data pulled from hospital records indicate an upsurge in total hospital occupancy, with the hospital consistently overcapacity. Such patients usually present with increasingly complex cases and comorbidities, including sleep apnea and obesity.

Hospitalization rates rise with age (11), and with an increasingly aging population, the rate of admissions to ~~hospitals~~ is ~~are~~ expected to continue to intensify [11].

Resting and Recovering with the AirCurve™ 10 VAuto

The wonder of the AirCurve™ 10 VAuto is its versatility and adaptive ventilation [12]. With its advanced algorithm, it automatically detects irregular breathing, apneic and hypopneic events, and adjusts its pressures accordingly. It can be set to Auto-BiPAP mode, Auto-CPAP mode, set CPAP or set BiPAP.

As a homecare device designed for comfort and patient synchrony, it is the optimal choice to help with patient compliance, a known setback to the positive pressure therapy. It's quiet, customizable and dependable, making it the ideal loaner unit for an inpatient with multiple comorbidities. In a Canadian study on adherence to PAP therapy, consistent use was associated with less hospitalizations. [12].

Even one night's sleep would provide a clinician with a comprehensive report, giving them valuable data on usage, mask fit, leakage, the patient's AHI, and pressures required for optimal patient treatment. Armed with this information, the clinician can take immediate steps to improve the patient's outcome and quality of life while in the hospital, and after discharge.

Furthermore, having this machine would ensure that the hospital's rescue non-invasive ventilators, currently the only machines capable of BiPAP, could be instead used for emergency situations and critical care.

Conclusion

According to UptoDate, an estimated 15-30% of males and 10-15% of females in North America are affected by obstructive sleep apnea [13]. In an American study, it was found that people with severe sleep apnea have a much higher mortality risk than people without sleep apnea (estimated to be three times more), and that number only increases when the disease is untreated [14].

Since October 2023, Brockville General Hospital has ~~had been~~ over 100% capacity of admitted patients every month [10]. The volume of inpatients and the length of their stay has been consistently increasing, and with the continued uptick in sick and aging population, likely will continue to do so. A large fraction of the patients in question (placeholder for statistics from email) will be suffering from obstructive sleep apnea.

With its advanced algorithm capable of automatically detecting and setting the appropriate pressures for a patient, its versatile modes, focus on patient comfort, and easily accessible data, it is the ideal choice to 1) treat patients, leading to improved outcomes and shorter hospital stays, 2) improve patient compliance, and 3) free critical care non-invasive machines.

For more information on the features of the AirCurve™ 10 VAuto, please visit their website at <https://www.resmed.com/en-us/healthcare-professional/products-and-support/devices/aircurve-10-vauto/>

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