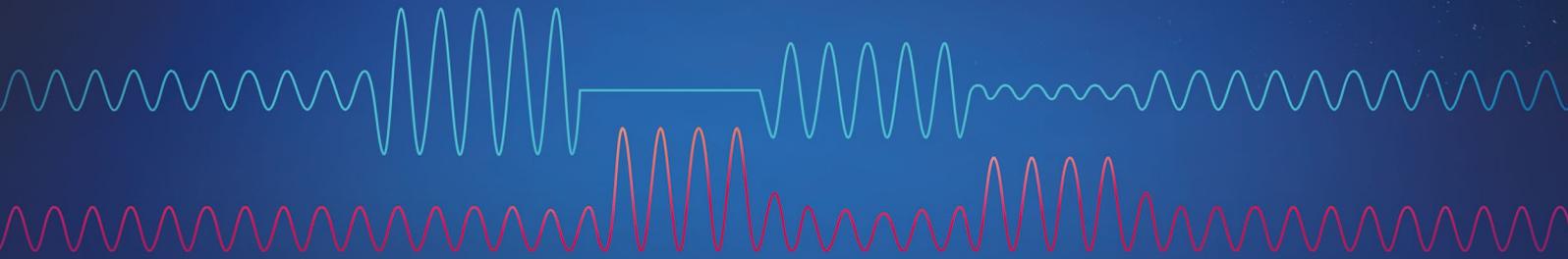




ResMed

AirCurve™ 10

CS PACEWAVE



Adaptive Servo-Ventilation in practice

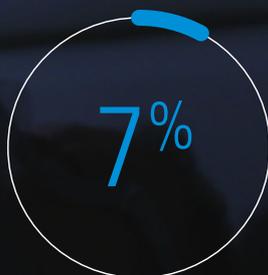
Learn more about ASV therapy with
the AirCurve™ 10 CS PaceWave

How prevalent is central sleep apnoea?

Prevalence studies show that:



of patients on opioids suffer from central apnoea or combined obstructive and central sleep apnoea.¹



of ischemic and haemorrhagic stroke and transient ischemic attack (TIA) patients suffer from primarily central apnoeas.²



of HFpEF patients suffer from central sleep apnoea³ and more than 50% from sleep disordered breathing.⁴



Summary

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Prescribing ASV

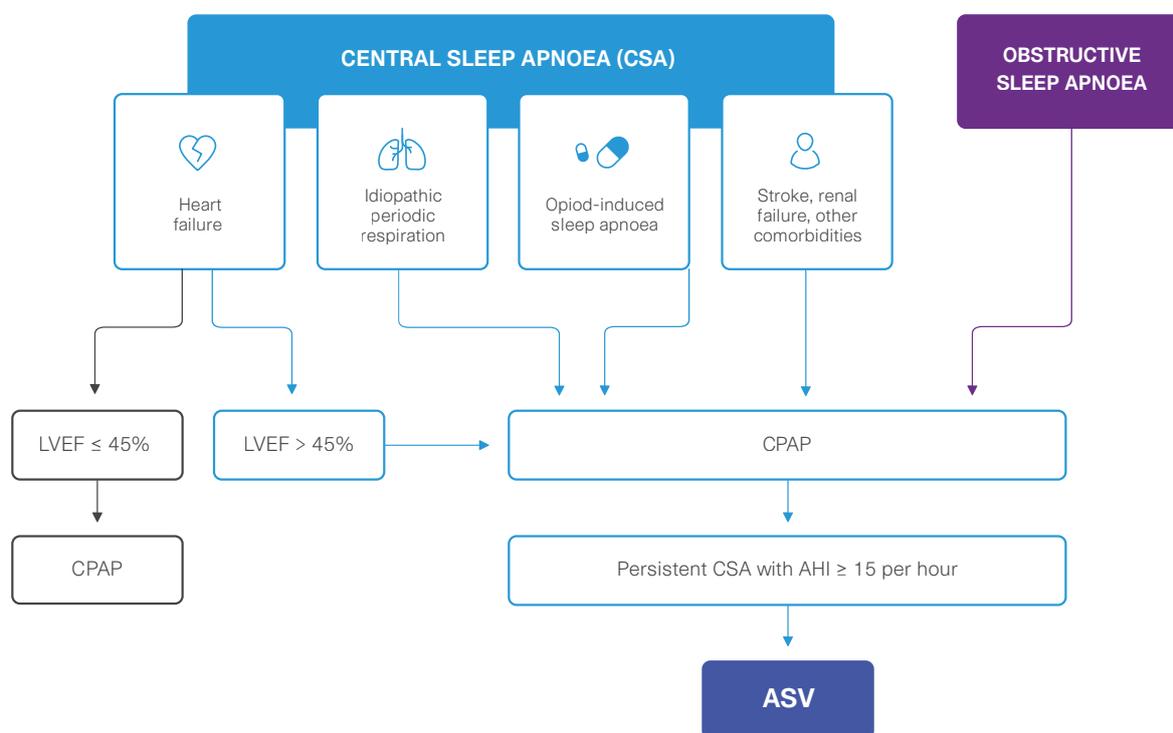


When can ASV therapy be prescribed?

Guidelines states that ASV therapy can be prescribed in several clinical situations. The ERS statement on central sleep apnoea⁵, the AASM guidelines⁶, and various statements^{7,8} confirm that **ASV is eligible and may be useful, effective and safe in these different situations:**

- Central sleep apnoea in heart failure with preserved ejection fraction
- Central sleep apnoea associated with long-term opioid therapy without alveolar hypoventilation
- Idiopathic central sleep apnoea or Cheyne-Stokes respiration
- Complex emergent/persistent central sleep apnoea
- Central sleep apnoea after ischemic stroke

The ERS statement on the treatment of central breathing disturbances during sleep



Adapted from the ERS statement about CSA⁵



Contraindications: As highlighted by the ERS⁵, AASM⁶ and expert statement^{7,8}, ASV therapy should not be prescribed in heart failure with reduced ejection fraction and predominant moderate-to-severe central sleep apnoea.

When can't ASV therapy be prescribed?

Serve-HF: summary of results

The SERVE-HF study showed that **the harmful effects of ASV therapy correlate with pre-existing left ventricular systolic impairment**⁹.

SERVE-HF researchers studied 1,325 patients who had chronic and symptomatic heart failure (NYHA 2-4), reduced left ventricular ejection fraction (LVEF \leq 45%) and moderate to severe predominant central sleep apnoea.



SERVE-HF

Treatment of Sleep-Disordered Breathing by Adaptive Servo-Ventilation in HF patients

Several hypotheses about the increased mortality observed in SERVE-HF have been invalidated by multiple analyses of the SERVE-HF database or other large registries:

- **ASV may not have an effect on left ventricular function or remodelling** and does not affect **systemic markers associated with heart failure syndrome**.⁸
- The mortality risk seen in SERVE-HF is **unrelated to the magnitude of the pressure delivered**.¹¹



All the guidelines and expert statements published since May 2015⁵⁻⁸ confirm that **ASV therapy should not be initiated in the at-risk group of patients**, namely in those with chronic and symptomatic heart failure (NYHA 2-4) with reduced left ventricular ejection fraction (LVEF \leq 45%) and moderate to severe predominant central sleep apnoea.



Scientific societies statement on SERVE-HF



European Respiratory Society⁵

ASV normalises the AHI in patients with CHF and CSA more effectively compared to CPAP therapy and nocturnal oxygen. Before starting a patient with CSA on ASV, the members of the Task Force assess for the presence of HFrEF with an LVEF \leq 45% to see if they are in the higher risk group.



American Academy of Sleep Medicine⁶

Adaptive servo-ventilation targeted to normalize the apnoea-hypopnea index (AHI) is indicated for the treatment of CSAS related to CHF in adults with an ejection fraction $>$ 45% or mild CHF-related CSAS.



French Society of Sleep Research and Medicine⁷

Data from the literature advocate the continued use of ASV in different indications, including heart failure with preserved LVEF, complex sleep apnoea syndrome, opioid-induced central sleep apnoea syndrome, idiopathic central SAS, and central SAS due to a stroke.

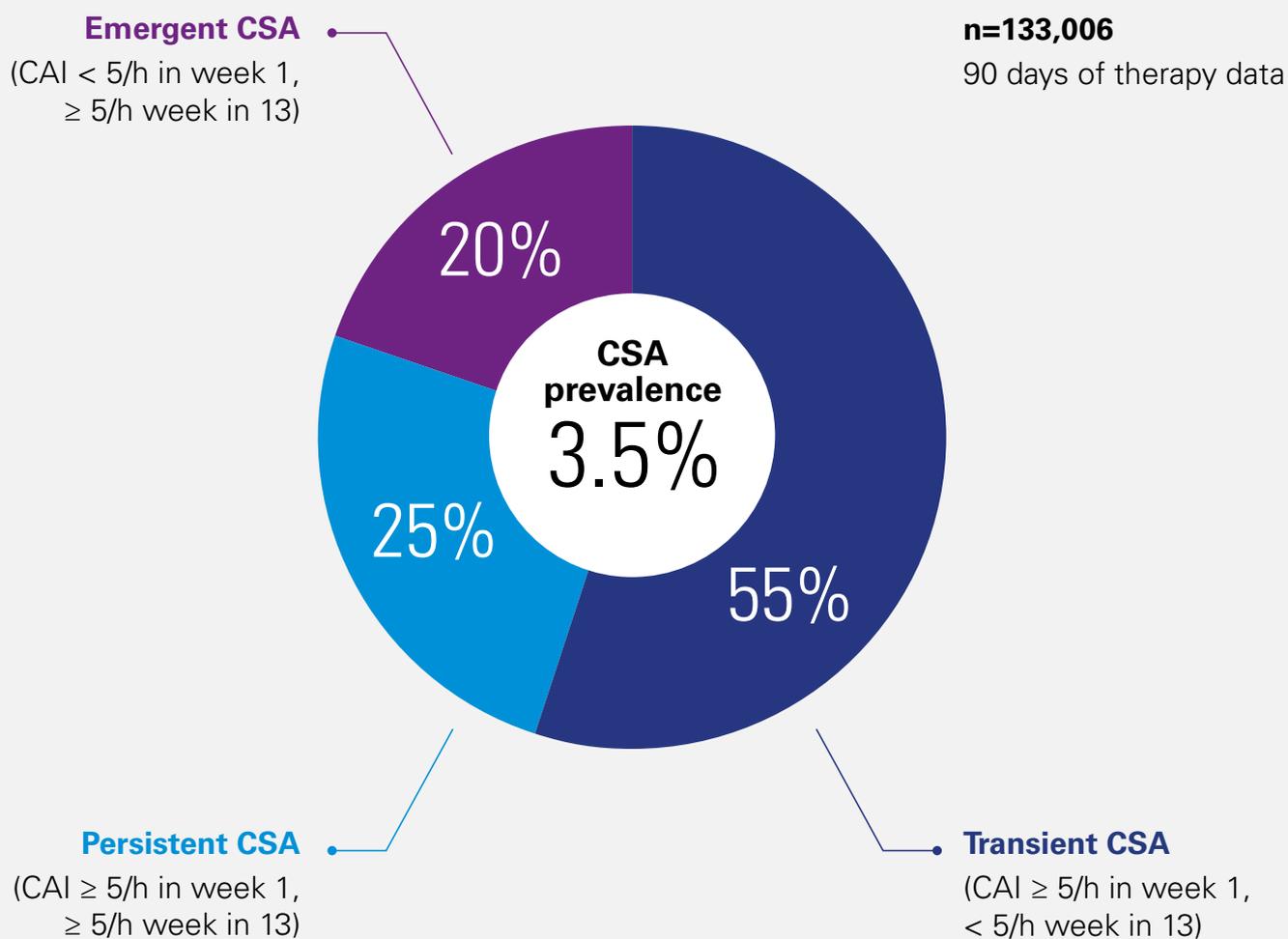


Clinical updates: insights from a big data analysis



Prevalence of central sleep apnoea during CPAP therapy

According to a very large observational analysis of ResMed's American AirView database, which includes 133,000 patients receiving CPAP therapy¹², **3.5% of patients receiving CPAP therapy have emergent, transient or persistent central sleep apnoea with central apnoea index (CAI) >5.**



Switching from CPAP to ASV

Another analysis from ResMed's American AirView database¹³ shows that **switching from CPAP to ASV in patients with emergent or persistent central sleep apnoea may improve compliance:**

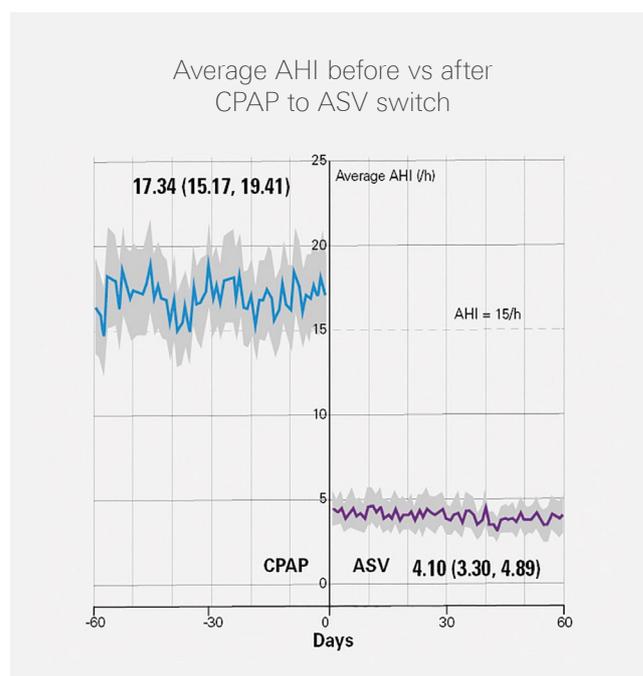
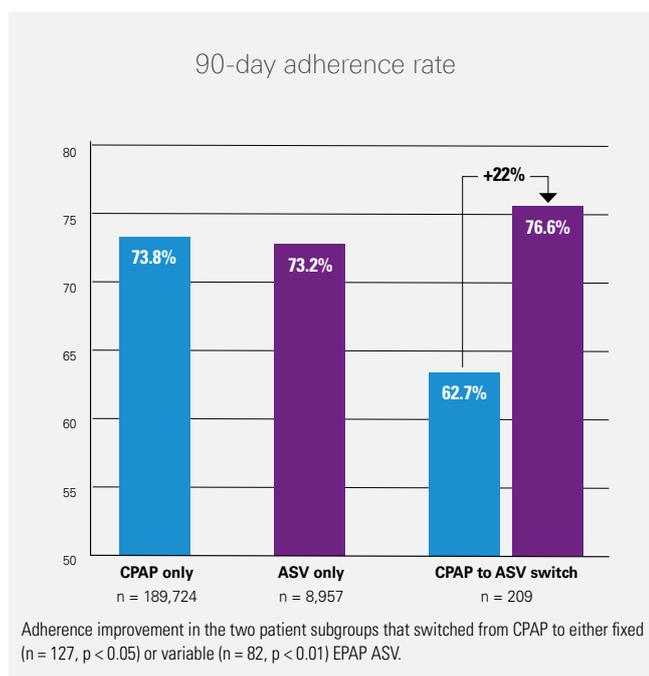
- Switching patients with emergent or persistent central sleep apnoea from CPAP therapy to ASV **improves adherence by 22%** and **maintains mean compliance at a stable level.**
- The switch reduces residual AHI from 17.34 (15.17, 19.41) to 4.10 (3.30, 4.89).
- These data suggest that the normalisation of central sleep apnoea through treatment with the AirCurve 10 CS PaceWave device **contributes to better long-term adherence.**



Improvement in adherence rate after patients with emergent or persistent CSA switched from CPAP to ASV.



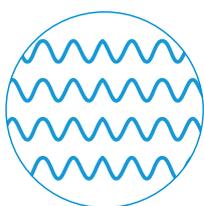
The switch from CPAP to ASV **reduced residual AHI from 17.34 to 4.10.**



ResMed's solution

Discover the AirCurve 10 CS PaceWave

The AirCurve 10 CS PaceWave[®] delivers **personalised therapy for patients with central sleep apnoea**, with or without obstructive sleep apnoea. The PaceWave algorithm **synchronises with the patient's own respiratory patterns** and **mimics the shape of natural breathing** to promote comfort, safety* and harmony. PaceWave responds to the patient's changing respiratory needs and **makes it possible to stabilise their breath during sleep**.



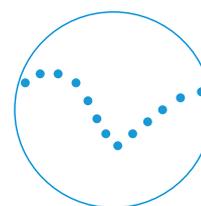
COMFORT

The PaceWave algorithm synchronises with the patient's own respiratory patterns, **providing personalised therapy comfort**. The Easy-Breathe wave form mimics the shape of natural breathing **to promote comfort**. Pressure Support (PS) is **accurately synchronised** with the patient's spontaneous breathing.



SAFETY*

PaceWave normalises the patient breathing^{13,14}. ASV therapy also **stabilises the physiological variables associated with breathing**, such as respiratory rate and oxygen level¹⁵⁻¹⁸. Stable physiological variables during sleep are an important factor **that may improve sleep quality, rest and quality of life**.



HARMONY

Synchrony between the device and the patient's spontaneous breathing **improves therapy acceptance¹³ and creates harmony**.

About the PaceWave algorithm

The AirCurve 10 CS PaceWave is designed to stabilise the patient's breathing. This is achieved through:



Variable inspiratory pressure support



Constant and adjustable expiratory positive airway pressure (EPAP)

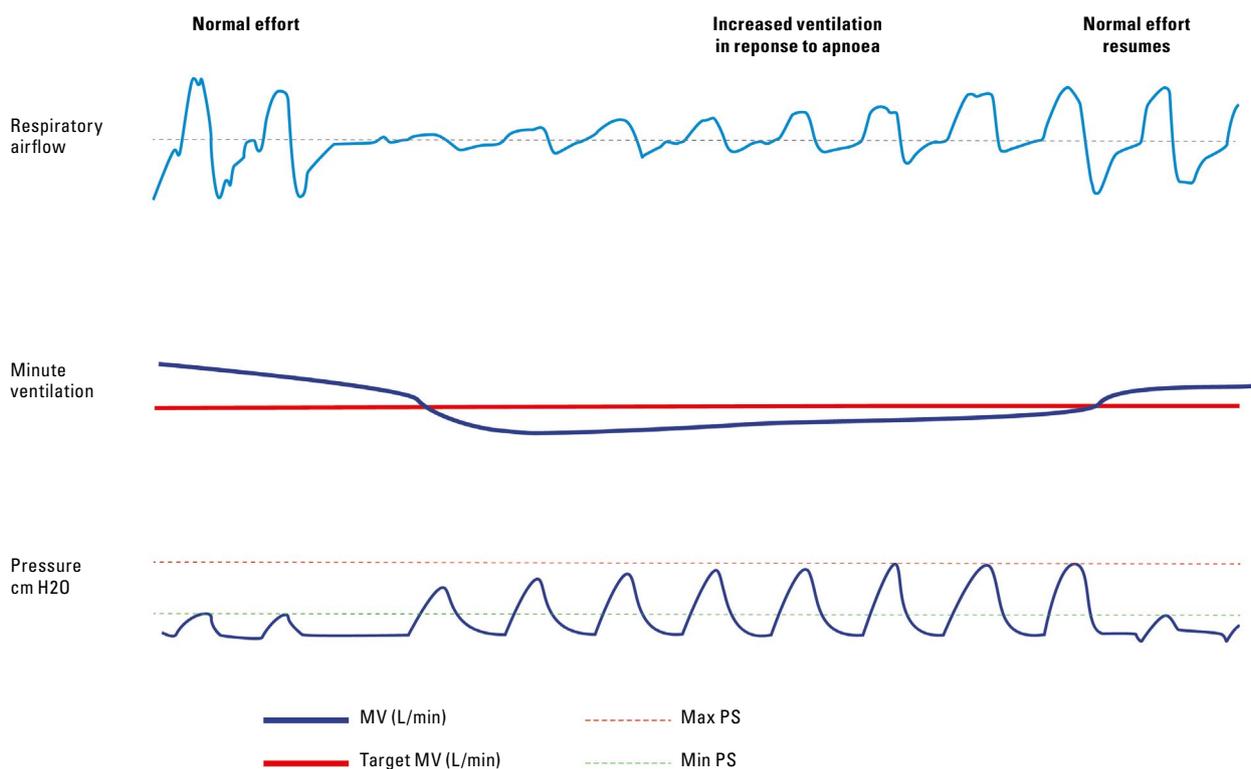


Respiratory support synchronised with the patient's breathing

Minute Ventilation

As of July 2019, PaceWave is the only adaptive servo-ventilation device to target the patient's own recent minute ventilation.

- The PaceWave algorithm calculates respiratory parameters (frequency, shape of the breathing wave, tidal volume) at a **split-second resolution on a 3-minute moving average**, in order to calculate the patient's own minute ventilation.
- The target is automatically set to 90% of the patient's average recent minute ventilation **to prevent over-ventilation**.
- PaceWave compares the patient's current minute ventilation with the target minute ventilation and **responds rapidly and precisely to changes in minute ventilation**.
- Pressure support is increased when minute ventilation falls below target and is reduced to the minimum level set by the physician when minute ventilation exceeds the target.



Breath phase mapping

PaceWave analyses 13 points per breath and accurately monitors and adjusts its response **to deliver a comfortable experience for the patient.**

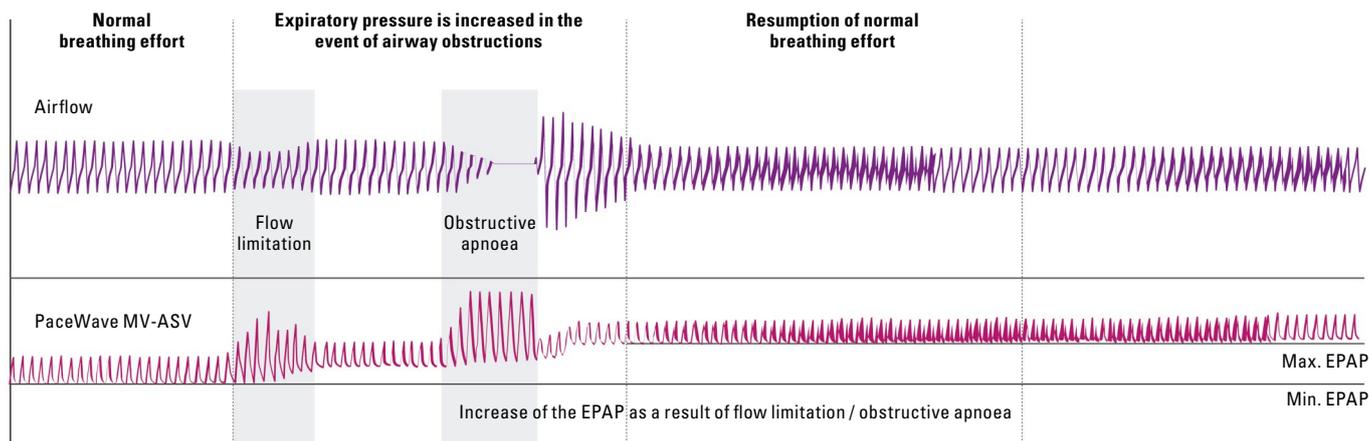
- With its high-resolution breath phase mapping algorithm, PaceWave **accurately monitors variations in minute ventilation**, caused by changes in the respiratory rate and breathing pattern.
- The PaceWave algorithm **adapts precisely and rapidly** in response to the patient's needs.
- **Effective synchronisation** with patient's own respiratory patterns **contributes to therapy comfort.**
- PaceWave **continuously learns** from each patient's unique respiratory pattern.
- The Easy-Breathe wave form **mimics the shape of natural breathing.**
- Pressure support is synchronised with the patient's spontaneous breathing and adapted to their minute ventilation in order to achieve the target level. **This provides comfort that supports patient acceptance of the therapy.**



ASV and ASVAuto mode

The AirCurve 10 CS PaceWave ensures **effective treatment by stabilising upper airways and delivering constant expiratory pressure.** It features two modes: ASV and ASVAuto.

- **ASV mode:** expiratory positive airway pressure is manually titrated and set at the start of therapy.
- **ASVAuto:** expiratory positive airway pressure is automatically adjusted in response to predictive signs of upper airway obstructions (apnoea, flow limitation and snoring). Automatic expiratory positive airway pressure responds to obstructive events and stabilises the upper airways.

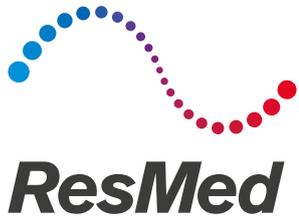




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* ASV therapy is contraindicated in patients with chronic, symptomatic heart failure (NYHA 2-4) with reduced left ventricular ejection fraction (LVEF \leq 45%) and moderate to severe predominant central sleep apnoea.

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AirCurve™ 10

CS PACEWAVE



Learn more about the PaceWave algorithm
and how to treat your CSA patients:

[ResMed.com/PaceWave](https://www.resmed.com/PaceWave)