

## What Is Adaptive Servo-Ventilation (ASV)?

ASV is a device similar to continuous positive airway pressure (CPAP), bilevel positive airway pressure (BPAP) and auto positive airway pressure (Auto-PAP) that delivers pressurized air through tubing and face mask. ASV is a more specialized machine that measures your breathing patterns and customizes the pressure delivered to stabilize breathing throughout the night. One type of breathing problem during sleep is central sleep apnea (CSA). Central sleep apnea is a problem where you do not take enough breaths in a minute—your breathing rate is too slow or you have long pauses without breathing. There are different types of central sleep apnea.



The ASV device may be helpful for some people who have central sleep apnea. However, use of the ASV can cause problems for some people who have heart failure. If you have heart failure and trouble breathing while asleep, there may be other options to help improve your sleep. This fact sheet describes the ASV device and which people it may be useful for. It also discusses the risk it may pose for people who have congestive heart failure.

### Who should use ASV?

There are several groups of people who have central sleep apnea (CSA) who may be good candidates to use ASV. These include people who have:

- Primary CSA
- Systolic heart failure (with Cheyne-Stokes breathing (CSB)) and ejection fraction (EF)  $\geq$  45%
- Treatment-emergent CSA or Complex CSA—these are people who have obstructive sleep apnea and develop CSA when treated with CPAP, BPAP, or Auto-PAP
- CSA related to high altitude

- CSA occurring after brief arousals from sleep
- Narcotic-induced CSA

### How can I tell if I have CSA and might benefit from using ASV?

If you suspect you have a breathing problem during sleep, you should talk to your healthcare provider or see a sleep specialist. You will usually be asked to have a sleep study (polysomnogram) done. During the sleep study, they can see if you have obstructive or central sleep apnea or both. You can then find out what therapy may be best for you to try to improve your breathing and sleep. Your doctor will assess if you are a candidate for ASV after performing a complete medical examination and assessing your heart function. For more information on sleep studies, go to ATS Patient Information series at [www.thoracic.org](http://www.thoracic.org).

### Why can use of ASV be a problem?

A research study (SERVE-HF) following a group of people who had a known heart disease with congestive heart failure (CHF) and were using the ASV device raised concern that there may be a higher risk of sudden cardiac death. The findings of this study were unexpected.

The findings in the SERVE-HF study may have been due to chance (bad luck). It was possible that one group was sicker than the other by chance and thus the poor outcomes may have been related to patient characteristics rather than a real effect of the ASV therapy.

There may be direct effects of ASV which could affect breathing patterns or heart function. The ASV settings can sometimes lead to hyperventilation (breathing too much) which can lead to respiratory alkalosis (low carbon dioxide, high pH in the body) and electrolyte abnormalities. These changes, if present, could trigger arrhythmias (irregular heart beating) which could lead to sudden cardiac death.

Changes in medications including stopping medications or health behaviors (starting excessive activity slightly) may have contributed to the adverse events.

### Should I stop using my ASV device if I have a heart problem?

You should talk to your healthcare provider about why you are using the ASV device and what risk it has to you. People with complex sleep apnea (treatment-emergent central apnea), narcotic-induced central apnea, and sleep disordered breathing (SDB) with congestive heart failure (CHF) with preserved ejection fraction would not need to stop using ASV. However, if a person has a new diagnosis of CSA with poor heart function (ejection fraction  $EF \leq 45\%$ ), starting ASV is not advised. If you have CSA and heart failure with reduced ejection fraction, your specialist will decide with you the risks and benefits of continued use. For people who continue to use ASV with CHF, a complete medical evaluation and careful medical therapy are essential.

### What other treatment options are available if I need to stop ASV?

In some cases, changing from ASV to standard CPAP could be considered. Other treatment

options such as oxygen and medicines that help the body clear extra fluids may be used. Use of a medicine such as acetazolamide with careful monitoring of blood potassium and magnesium levels may be beneficial.

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## Rx Action Steps

- ✓ If you have central sleep apnea, ask your healthcare provider or sleep specialist about use of the ASV device.
- ✓ If you have trouble breathing during sleep and have congestive heart failure, talk to your healthcare provider about how to get help to improve your sleep.
- ✓ If you are using an ASV device, talk to your healthcare provider about how it is working for you and any possible risk it may have to you.

**Healthcare Provider's Contact Number:**

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### Additional Resources:

#### American Thoracic Society

<https://www.thoracic.org/patients>

– Central Sleep Apnea in Adults

#### American Sleep Association

<https://www.sleepassociation.org/sleep-treatments/cpap-machines-masks/adaptive-servo-ventilation/>

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