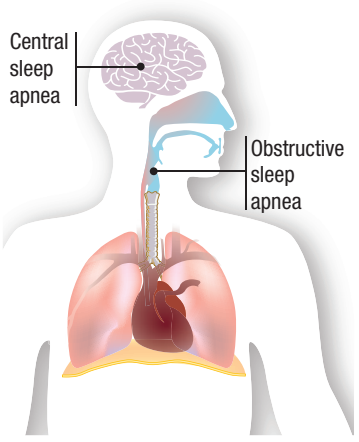
What Is Central Sleep Apnea in Adults?

Central sleep apnea (CSA) is a type of breathing abnormality that can happen during sleep. With CSA, there are pauses in breathing caused by signaling problems in the brain. CSA is different from obstructive sleep apnea (OSA), which causes abnormal breathing due to the collapse of the soft tissues in the back of the throat, leading to blockage of the airway. For more information on OSA, see the ATS Patient Information Series fact sheet on OSA. CSA is less common than OSA. It affects men more than women and occurs more frequently in older adults. CSA can also be seen in children. Some people may have a combination of CSA and OSA. Left untreated, CSA can result in poor quality sleep, daytime symptoms and low oxygen level (hypoxemia).



What are the common symptoms of CSA?

People who have CSA typically may have the following symptoms:

- disrupted sleep
- insomnia
- frequent awakenings from sleep
- excessive daytime sleepiness
- poor concentration
- memory problems or
- morning headaches

Some may report that their bed partners have noticed they don't breathe regularly or have breathing pauses during sleep. These symptoms are not specific for CSA and are similar to those reported by patients with OSA. Snoring may also be present, though not as severe as that in OSA.

What are the causes and risk factors for having CSA?

CSA is frequently associated with conditions such as

- heart disorders (congestive heart failure, heart rhythm problems like atrial fibrillation or atrial flutter)
- neurologic conditions (stroke, brain lesions, central nervous system birth defects)
- use of opioid medications (morphine, hydrocodone, oxycodone, fentanyl and methadone)
- kidney failure
- living at a high altitude over 2500 meters (8200 feet)
- use of continuous positive airway pressure (CPAP) for OSA
- genetic syndromes (Prader-Willi syndrome or Rett syndrome)

For some people, the cause of CSA cannot be identified, and is called idiopathic central sleep apnea. Identifying the cause is important as this helps guide treatment of people with CSA.

How do I know if I have CSA?

If you have symptoms or have risk factors , you need to talk with your healthcare provider. They can help you decide if you need to undergo a sleep study (polysomnogram) to determine whether you have sleep apnea. Whenever there is a concern for CSA, the preferred diagnostic test is a full night polysomnogram (sleep study in a sleep laboratory) rather than a home sleep study. The sleep study will determine your breathing pattern and levels of oxygen. You may also be monitored for carbon dioxide (CO_2) levels if there is concern for high CO_2 levels or weak shallow breathing. If you have CSA with a high CO_2 level (called hypercapnia), you will need testing for other disorders. For more information on sleep studies, see ATS Patient Information Series on Sleep Studies: In the Sleep Laboratory and in the Home.

What should I expect if I get diagnosed with CSA?

If you are diagnosed with CSA, you may be referred by your healthcare provider to a sleep specialist to help figure out the possible cause of your CSA and assist in management. If necessary, further testing may be needed and may include a heart ultrasound (echocardiogram), brain, and/or blood work. If your CSA is related to using the positive airway pressure (PAP) machine for OSA (also known as treatment-emergent CSA), your sleep specialist will closely monitor the information collected by the PAP machine and see if an adjustment is needed in the settings.

How is CSA treated?

Initial treatment of CSA involves identifying and optimizing any underlying medical condition. Your healthcare provider, sleep specialist and other specialty providers (cardiologist, neurologist, kidney doctor or pain specialist) will work together to provide the best care.

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Am J Respir Crit Care Med Vol. 203, P18-P19, 2021

Below are some examples of what may be recommended depending on the cause of your CSA.

Cause	Management
Heart failure	Cardiac medications, advanced heart failure therapies
Kidney failure	Fluid balance with diuretics or dialysis
Stroke	Antiplatelet medication, control of blood pressure
Opioid medication	Safely stopping or cutting back on the medication
High altitude	Going safely to a lower altitude
Treatment-emergent CSA	Close monitoring recommended since this typically gets better over time
Neuromuscular weakness associated with a high carbon dioxide level (hypercapnia)	Noninvasive ventilation with/without backup rate, tracheostomy with home ventilator

Compared to OSA, CSA is often more difficult to fully control. When CSA persists after the primary cause is addressed, your sleep specialist may discuss other treatment options. This may be the case for people who have symptoms, have significant or worsening medical problems, or have low oxygen levels during sleep. Treatment options currently available for CSA include PAP or noninvasive ventilation, oxygen, phrenic nerve stimulator, or medications.

PAP therapy or noninvasive ventilation: There are different types of machines that may be used in CSA. These include continuous positive airway pressure therapy (CPAP), bilevel positive airway pressure therapy (bilevel PAP) with or without back up rate or ASV (adaptive servo ventilator). The choice of the type of therapy will be discussed by your sleep specialist and is based on the results of your sleep study and your underlying medical problems. If your CSA is associated with a high carbon dioxide level, bilevel positive airway pressure therapy with a backup respiratory rate or noninvasive ventilation is typically used. Less common, causes that are known to progress overtime, may need a tracheostomy (hole in the neck with a breathing tube) and home ventilator during sleep. For more information on PAP therapy and noninvasive ventilation, see ATS Patient Information Series topics listed under Resources

Oxygen: If you have a low oxygen level during your sleep study, you may be prescribed oxygen during sleep. This may be used with or without PAP therapy depending on your carbon dioxide level during the test.

Phrenic nerve stimulator: This may be an option for select people who have CSA and are unable to tolerate PAP therapy or have persistent CSA despite using PAP therapy. It is a surgically implanted device that stimulates the phrenic nerve and results in contraction of the diaphragm. This is performed in specialized centers. Currently, long term success and outcomes with this treatment is being studied.

Medications: Certain medications like acetazolamide, theophylline or caffeine can stimulate your breathing and may be used for CSA. They may be tried if you are unable to tolerate the other therapies. You will need to be closely monitored if you are started on them.

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Rx *Action Steps*

- ✔ Talk to your healthcare provider if you have symptoms of CSA and have medical conditions that increase your risk for CSA.
- ✔ Ask your healthcare provider if you need a sleep study.
- ✔ Discuss with your provider the best form of therapy for your CSA.
- ✔ Ask your healthcare provider how to minimize the use of narcotics if you are taking them for pain control.

Healthcare Provider's Contact Number:

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Resources

American Thoracic Society
- www.thoracic.org/patients/
  - Obstructive Sleep Apnea in Adults
  - Diaphragmatic Pacing
  - PAP therapy
  - Sleep studies in the Laboratory and Home
  - Use of ASV for People with Heart Failure and Trouble Sleeping
  - Breathing Problems in Adults with Neuromuscular Weakness
  - Obesity Hypoventilation Syndrome

American Academy of Sleep Medicine
- http://sleepeducation.org/sleep-disorders-by-category/sleep-breathing-disorders/central-sleep-apnea/overview-facts

American Sleep Apnea Association
- https://www.sleepapnea.org/learn/sleep-apnea/central-sleep-apnea/

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) ≥ 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.

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.

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Am J Respir Crit Care Med Vol. 204, P3-P4, 2021

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 ≤ 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/