

# Obstructive Sleep Apnea in Children

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## What is obstructive sleep apnea (OSA)?

Sleep apnea is a pause in breathing while sleeping, and obstructive signifies that this happens because the upper airways (the passages through which the air travels in order to reach the lungs) are blocked, preventing air from entering the lungs. This is different from central sleep apnea, in which there is a pause in breathing because no signal to breathe is sent from the brain.

## What causes OSA?

In order to answer that, it is helpful to first review the sequence of events which normally occurs during breathing. A signal is sent from the brain to the respiratory muscles, the largest of which is the diaphragm, found at the base of the chest. When the diaphragm contracts, negative pressure is generated inside the chest, sucking air in through the airways and into the lungs. Within the lungs, oxygen is absorbed, and carbon dioxide is released. At the end of the breath there is relaxation of the respiratory muscles, which generates positive pressure inside the chest, and the air is exhaled.

The negative pressure generated inside the chest during inspiration has almost no effect on the first segment of the airway (the windpipe and voice box), because of its stiffness, and it hardly changes in dimension. Above the voice box, the upper airway is a tube made of soft tissue, comprised of skin, tonsils, adenoids, tongue, muscle, and fat, which gets sucked inwards by the negative pressure. If the upper airway is crowded, it becomes narrowed, both restricting airflow and leading to an increase in the negative pressure generated, resulting in partial or full collapse of the upper airway. This is similar to what occurs when sucking on a drinking straw while putting one's finger at the tip of the straw and slowly covering up the end. At a certain point, the negative pressure within the straw overcomes the straw's ability to remain patent, and it collapses inward, limiting or fully stopping all airflow through it.

The collapse of the upper airway prevents air from adequately entering into the lungs until the obstruction is relieved. This can cause changes in both the blood oxygen and carbon dioxide levels, and is usually terminated by a physical arousal, a disruption in the sleep patterns, or both, which result in fragmented and interrupted sleep.

## Why doesn't the upper airway obstruction occur during wakefulness?

In some children, partial upper airway obstruction does occur while they are awake. These children often sound congested, and appear to breathe better in certain body positions. However, once asleep, muscle tone is more relaxed than while awake, particularly in the stage of sleep called REM (rapid eye movement sleep). This relaxation of muscle tone causes the dimensions of the upper airway to become smaller, which leads to dynamic collapse during inspiration and to either partial or complete obstruction.

## How common is obstructive sleep apnea?

OSA is quite common, affecting between 2-5% of all children. It is more common in children with underlying medical problems, including chromosomal disorders (such as Down syndrome), low muscle tone, craniofacial abnormalities, and obesity.

## OK, so my child snores. Why is this a problem?

OSA is a serious health problem at any age. In adults, OSA is known to cause high blood pressure, poor sugar tolerance, increased incidences of heart disease and stroke, pulmonary hypertension, and right-sided heart failure. In children, in addition to all of these, it is also known to cause poor growth, delayed development, decreased school performance, and increased attention problems.



## How do I know if my child has OSA?

The clinical history is usually quite informative. Most children with OSA snore, and this snoring is often accompanied by pauses in breathing, snorting, choking and gasping for breath. Children with OSA often breathe with an open mouth, and sleep with their necks extended in an effort to open their upper airways and allow for better passage of air through them. Sometimes a noticeable change in nighttime breathing patterns is associated with changes in behavior or in school performance. Children who have OSA can complain of waking up with a dry mouth or headaches in the morning. In some children, nighttime bed wetting returns after months or years of the child being dry at night.

The only way to be sure whether or not a child has OSA is by doing a sleep study. This involves spending a night in the sleep lab (in the accompaniment of a parent), where the child sleeps hooked up to monitoring equipment that measures different physiologic data. After analyzing these data, a sleep specialist can determine whether or not the child has OSA, and if so, how severe it is.

## If my child has OSA, what happens?

Most children with OSA are referred to an Ear, Nose & Throat specialist for removal of the tonsils and the adenoids. While this is generally curative in about 85% of children, the success rate in older children, children who are obese, and those with other underlying medical issues is not as high. If your child does undergo surgery, she or he may need to have a follow up sleep study 6-8 weeks afterwards, to make sure that the surgery has brought about full resolution of the upper airway obstruction.

If there is still residual obstruction, or if your child is not a candidate for removal of the adenoids and tonsils, he or she may be referred back to the sleep lab for a continuous positive airway pressure (CPAP) titration study, or for other surgical interventions, if warranted.

## What is CPAP?

CPAP stands for continuous positive airway pressure. It is given by a machine which blows air into the upper airway at a pre-set, constant pressure. The machine is attached by an air hose to a mask worn on the face while sleeping. The positive pressure expands the upper airway and prevents its collapse during inspiration. The optimal pressure setting is identified during a titration study, during which different pressures are trialed to determine the lowest pressure required to successfully prevent obstruction. While CPAP can appear cumbersome at first, most children, including those with special needs, successfully adapt to it, and learn to associate wearing it with feeling better during the day. Close follow up is important to make sure that the CPAP is being used correctly and that difficulties using it are addressed quickly in order to prevent its use from becoming unpleasant to the child.

## If my child is prescribed CPAP, does that mean that s/he will need it forever?

No. As OSA is a disease process resulting from the interaction of many factors, it is possible that with time some of these may lessen. For example, OSA in a child who is overweight may lessen or completely resolve with weight loss. On the other hand, the degree of OSA present can also worsen with time, requiring using CPAP at higher pressure settings. This is why children who are on CPAP need to be seen by their physician on a regular basis to ensure that they continue to receive appropriate therapy.

