



**“I need a good
night’s sleep.”**



Information for Sleep Apnea Patients and their Families



“I need a good night’s sleep.”

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Dear Reader,

Most everyone knows that we spend about one-third of our lives asleep. It's not as well-known that healthful sleep is just as important as eating and drinking for our physical and mental health.

Occasional sleep disruptions can happen to anyone and are not necessarily a problem. However, some sleep disorders are critical and may last a lifetime. One such disorder is sleep apnea, which is characterized by severe nocturnal respiratory arrest. Without treatment, serious secondary diseases may develop.

Fortunately, there are treatment methods that can effectively reduce the negative consequences to the patient's health. Treatment significantly improves the quality of sleep and of life.

Read on the following pages about how you can improve your sleep, what sleep apnea is and how it can be treated.

For better, restorative sleep!

Your Löwenstein Medical Team

Healthful Sleep



Normal healthful sleep is restorative sleep. In order to adequately recover from the day's activities, most adults need between seven and nine hours of sleep. Sleep follows a defined rhythm, with each phase identified by its typical brain wave pattern in an EEG (electroencephalogram). Several sleep cycles occur which consist of different sleep phases divided into **non-REM sleep**, sleep onset, light and deep sleep and **REM sleep**, which leads into the dream sleep phase. A complete cycle lasts approximately 90 minutes and recurs several times per night in a healthy adult.

Sleep onset phase – Non-REM 1

In the "falling asleep" phase, sleep is light as the body relaxes and the EEG shows reduced brain activity that switches from alpha to theta waves. Slow eye movements can be seen, the pulse also slows and breathing becomes more even. Muscles relax and may twitch or the patient may experience a feeling of falling.

Light sleep phase – Non-REM 2

In the light sleep phase the body relaxes even more, the muscles release their tension, pulse and breathing are even, eye movements are no longer seen and the EEG shows only low-level activity. Healthful, restorative sleep begins.

Deep sleep phase – Non-REM 3

In this phase when the body is deeply relaxed, important regeneration mechanisms are activated for the next day. Consequently, this phase is particularly relevant for recuperation. Muscles are completely relaxed, heart rate and breathing continue slowing down and blood pressure decreases. The EEG records slow delta waves indicating deep sleep. During this phase the patient may sleepwalk or grind his/her teeth.

Dream sleep phase – REM

REM stands for "Rapid Eye Movement" that describes this phase of sleep. The movements of the eyeball are visible although the eyes are closed. During this phase, sleeping patients dream intensely and the EEG shows many small deflections. Muscles are still very relaxed, but heart rate and breathing speed up.

The amount of time spent in the individual phases varies over the course of a night of sleep. In the first third of the night, deep sleep occurs several times; REM sleep increases as morning approaches. After the last sleep phase, the body is again awake and alert as it increases all activities to the normal waking state.

Healthful sleep is characterized by sufficient time spent asleep, adequate portions of deep and REM sleep, an orderly sequence of sleep stages and sleep that is not disturbed by frequent, brief interruptions.

It is ancient knowledge that sound sleep can contribute to healing. However, even after decades of sleep research, it is still not completely clear which bodily processes lead to fatigue. We do know that no one can go without sleep. It is further known that tiredness is resolved by sleep and that through sleep, energy is gathered for the demands of the next day.

What is relatively new in medicine is the knowledge that disrupted sleep can cause illness and can do so even though a lack of quality sleep or not enough sleep is quickly noticed physically or psychologically. An affected person is tired, less efficient, more easily annoyed, more susceptible to sickness or unable to concentrate.

Occasional sleep disruptions are not necessarily harmful. They range from having nightmares to waking in reaction to conditions (e.g., light or temperature) in the immediate surroundings.

They are harmless when temporary, but over the long term, impairments to sleep quality can put a heavy strain on the mind and body. Then treatment is called for. The type of treatment is highly varied, depending on the cause of poor sleep, e.g., eating habits, age, stress or medications. Anyone can start by using the simplest means of improvement, such as following the rules of good sleep hygiene.





Sleep Hygiene

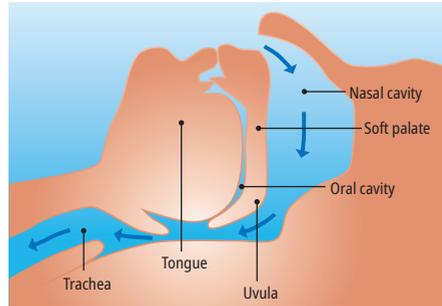
Practicing behavior that can lead to an improvement in sleep is referred to as “sleep hygiene.” You can try different methods at home to find what helps you most. In general, sleep should take place in a darkened room that is well ventilated and neither too warm nor too cold. You should go to bed at the same time and get up at the same time, including on weekends and vacations. When job-related circumstances such as shift work do not allow such regularity, you should attempt to get a reasonable amount of total sleep time.

Alcohol intake in the evening should be limited and large or heavy meals should not be consumed shortly before bedtime. Caffeine and nicotine should be avoided in the evening as both are known to disrupt sleep.

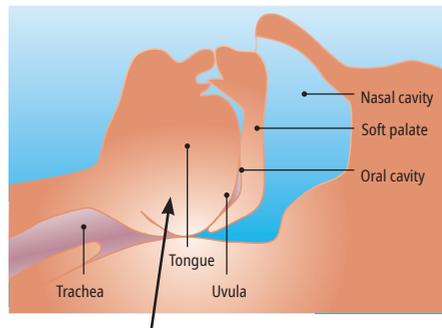
Getting enough sleep or doing relaxation exercises can have a positive effect on sleep. They counteract stress and prevent it from having a negative effect on sleep quality.

Using these sleep hygiene measures can often help to support or restore good sleep. However, some chronic sleep disorders cannot be helped over the long term by this behavior. One of those disorders is sleep apnea.

Open upper airways



Upper airways in obstructive sleep apnea



Breathing is interrupted when the tongue blocks the pharynx.



Sleep Apnea

The word “apnea” has Greek roots that mean “**not breathing.**” In cases of sleep apnea, the sleeping patient ceases to breathe. Apnea is said to be present when the interruption lasts longer than 10 seconds and occurs between five and 10 times per hour. During a single night, there may be hundreds of times when the patient stops breathing. In isolated cases, a break in breathing can last up to one minute.

Sleep apnea is in the group of illnesses known as “Sleep-Disordered Breathing”. The two types of sleep apnea are central and obstructive, although mixed forms also may occur.

In **central sleep apnea** the cessation of breathing is caused by a functional defect in respiratory regulation. At times the order to breathe does not go out from the respiratory center, resulting in an inadequate supply of oxygen to the body. After the body has a waking reaction, the order to breathe is again given and normal breathing resumes.

Central sleep apnea is often a consequence of a different health issue so treatment generally begins there, with the underlying ailment.

Obstructive sleep apnea is the more frequently occurring type of the disorder. In this case the respiratory center gives the order to breathe, but the inhaled air does not flow through the throat and into the windpipe (trachea). The same thing happens with exhaled air. The problem is a temporary obstruction of the upper airways which narrows or completely blocks the path for breathing. When the patient cannot exhale enough carbon dioxide or inhale enough oxygen, pulse and blood pressure drop and the body puts itself into an alarm condition which triggers an arousal. As a result of the waking reaction, breathing begins within a few seconds. As a rule, the affected person will not remember the event, but will notice the consequences of sleep disruption on the next day.



Causes

There are many causes of the narrowing or blocking of the airways. During sleep the muscles relax and, depending on the patient's anatomy, may make the airways narrow. The patient has no influence over involuntary muscle relaxation. That is not true for overweight, which often promotes obstructions. Likewise, consuming alcohol and nicotine, taking certain medications or sleeping on one's back may contribute to muscle relaxation and breathing difficulties.

Poor sleep habits or high levels of stress further increase the likelihood of apnea occurrences.

In rare cases, obstructive sleep apnea may be caused by other (particularly hormonal) illnesses such as thyroid insufficiency.

The morbidity of obstructive sleep apnea increases with age. In addition, men are more apt to be affected than women, but the causes are not entirely clear and a hormonal influence is only suspected.



Symptoms and Complications

Sleep doctors speak of a sleep apnea syndrome when symptoms or signs of illness arise in a patient diagnosed with sleep apnea. A distinction is made between the nighttime symptoms the patient may not be aware of and the daytime symptoms the patient perceives as a burden. The symptoms may eventually creep into everyday life. Because many patients are completely unaware of the nocturnal symptoms, they seldom associate their daytime limitations with poor sleep. However, others complain of restlessness at night, respiratory distress, severe sweating or have a partner who reports that the patient snores

irregularly or stops breathing. Those patients quickly see the connection between their daytime difficulties and nighttime problems. Their disordered sleep keeps them from reaching the deep sleep phase they need in order to recuperate.

Disrupted sleep has a negative effect on the quality of life. The main problem is daytime sleepiness. Manifestations may be chronic fatigue or the tendency to fall asleep. Coupled with anxiety and trouble concentrating, these conditions result in impairments that can occur in cases of sleep apnea and cause problems at work and in social life. Then there's also the



Nighttime Symptoms

- High blood pressure
- Respiratory distress, cardiac arrhythmia
- Sweating, restlessness
- Reported interruptions to breathing
- Irregular snoring

Daytime Symptoms

- High blood pressure
- Headaches in the morning
- Trouble concentrating
- Fatigue, sleepiness
- Dry mouth in the morning

increased risk of accidents in the home, in traffic or at work.

Given the extreme complications, obstructive sleep apnea is potentially life-threatening. Even a slight reduction in the amount of sleep a patient gets at night can lead to obvious sleepiness. Besides increasing the danger of accidents, a nocturnal lack of oxygen from sleep apnea can damage vital organs such as the heart and brain over time and give rise to severe secondary illnesses of the cardiovascular system. High blood pressure, for example, may develop if sleep apnea goes untreated. Cardiac arrhythmia often occurs with

nighttime respiratory arrest. Sleep apnea patients also have a significantly higher risk of suffering a stroke or heart attack or of developing diabetes.



Diagnosis

The multi-step process of diagnosing sleep apnea has proven itself over the past several years. The doctor first takes a detailed medical history from the patient. In a personal conversation, sometimes supplemented with a questionnaire, the sleep expert collects data about illnesses and symptoms.

If there is a suspicion of a sleep-related (breathing) disorder, a physical examination is made. Any typically associated diseases such as high blood pressure are taken into account.

If the examination does not eliminate the suspicion, an initial recording can be done in the third step while the patient is asleep in his own bed. The doctor provides the patient with a polygraph, a device that records sleep-related data, and instructions for its use. At bedtime the patient puts on the device, which measures and records breathing, oxygen concentration and pulse throughout the night. On the next day the patient returns the device to the treating physician for analysis. If the diagnosis is still unclear, the fourth step—a recording in the sleep lab—is taken.





In the Sleep Lab

In the sleep lab a more detailed recording will be made.

It is possible that sleep apnea has been confirmed by polygraphy and the degree of the disorder has to be determined. As a rule, however, **polysomnography** in sleep lab is used to confirm the diagnosis, to find the best patient-specific treatment or to try out the treatment under observation.

Polysomnography, the most complex examination in sleep medicine, is highly conclusive. Several sensors and electrodes are attached to the patient's body. The procedure is painless, as is

the overnight recording. Staff members with expertise in sleep medicine look after the patient. During the recording, breathing, oxygen concentration, pulse, muscle movements and the behavior of the sleeping patient are captured.

After the recording has been analyzed, the doctor reviews the results with the patient and talks about treatment options or recommendations.



Treatment

Sleep apnea is a chronic illness for which highly effective treatment is available.

As a rule, the treating physician passes along the recommendation from the sleep lab, where the most suitable method for the patient and the severity of the sleep apnea were discussed and tested. The patient also is encouraged to follow sleep hygiene recommendations. In some cases changes in behavior can help to relieve the symptoms. The same applies to weight reduction. It too can lead to partial or significant alleviation

of symptoms. Other therapy options include a special splint for the jaw, surgical measures and some methods whose effectiveness has not yet been supported by independent proof. Among the many possibilities, nighttime sleep apnea therapy is the most effective.

Regular use of the therapy device and successful treatment can minimize the symptoms and their effect on quality of life. Effective treatment not only benefits the patient's own health, but also decreases the potential danger to other persons.

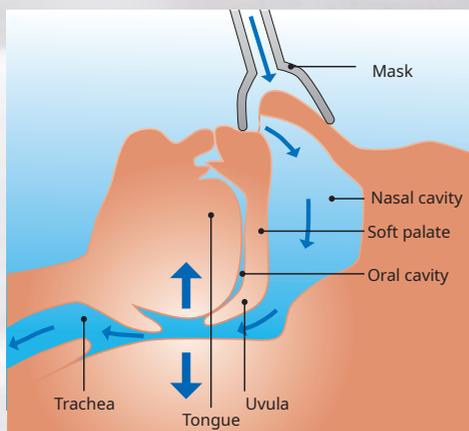


Sleep Apnea Therapy

At first many patients are frightened by sleep apnea treatment itself and its unlimited duration because they fear a major change to their lifestyles. In a detailed conversation with the doctor, possibly with the involvement of close ones or family members, the patient can be advised about all aspects of the therapy, including any inconveniences or discomfort and the prospects for treatment success. Generally, most misgivings diminish as the patient becomes acclimated

to treatment and feels quick results and improvements in daily life. After a certain amount of time most patients can sleep very well while being ventilated.

The nighttime positive pressure ventilation is the gold standard of treatment. The therapy devices, masks and accessories are continuously developed in order to achieve the greatest comfort for the patient. As a rule, today's devices are small, quiet and portable.



Positive Pressure Ventilation

The pressure applied to the patient via the mask (here a nasal mask) keeps the upper airways open.

Function

Sleep apnea treatment involves a therapy device, a mask and a breathing tube. With air drawn from the room, a small turbine in the inner workings of the device generates positive pressure. It is directed over the tube that links the device with the mask and then passed along over the mask to the upper airways. There the positive pressure acts as a splint to keep the patient's airways open so that inhalation and exhalation can take place normally. The device can be connected to a humidifier which moistens the air on its way to the mask and thus makes the treatment more pleasant.

Treatment Methods

The type of pressure support depends on the treatment used. The pressure is applied continuously in **CPAP** (Continuous Positive Airway Pressure). In **APAP** (Automatic Positive Airway Pressure), the device calculates the pressure within a previously set range with every breath. In **BiLevel** (BiLevel Positive Airway Pressure), the device adjusts the pressure to the patient's breathing with a higher pressure during inhalation and a lower pressure during exhalation. With patient-specific precision, the device provides more support as the patient inhales and reduces the pressure to make it easier for the patient to exhale.





Significance of the Mask

The choice of mask is very important to the success of treatment. It is worn on the face, one of the most sensitive areas of the body. The mask should fit well, not allow any air to escape and not cause any pain or pressure points.

The different mask types include **nasal** and **full face**. Which mask is more comfortable or more suitable for the patient's sleeping habits has to be determined for each patient.

Difficulties

Although sleep apnea therapy is highly successful, there is no guarantee of success in all cases even when all options are exploited. Sometimes the treatment does not work to a sufficient degree. In that case, an adjustment to therapy settings or the change to another ventilation mode helps. For most patients, however, the symptoms can be reduced significantly or even eliminated with **CPAP therapy** or a modified process.

On occasion, sleep apnea patients being treated may have trouble falling asleep or staying asleep. When therapy begins, some patients may experience anxiety or panic, but those feelings generally recede after the acclimation phase.



Patients gradually become used to the mask. It helps if they create pleasant conditions for sleep and relax before going to bed. Some patients with sleep disorders benefit from relaxation techniques like self-hypnosis.

If a patient lies awake for a long time, he or she should get out of bed. Sleeping pills should not be used habitually.

Problems that endanger success may arise during treatment. A significant narrowing of the nasal passages, for example, may make sleep apnea therapy impossible because the patient cannot easily breathe through the nose. Treatment by an ENT (Ear, Nose and Throat) doctor can solve the problem. The use of a heated humidifier also may help.

Another problem may develop if the patient's mouth is open frequently or continuously during treatment. The air entering the nose through the mask can then leak from the patient's open mouth. Then the mouth and throat dry out, endangering continued use of the device and potential success of treatment. A full face mask may be the solution to this problem.

Our Tips on Living with Treatment



Travel

If treatment is to be successful, it must take place without interruption, which means that the therapy device and mask should be used during vacations too. If there is a break in treatment, symptoms and complications generally come back very quickly. The therapy devices from Löwenstein can be taken on trips with no trouble at all. The device can be ideally protected in a transport bag specially designed to accommodate it and all related equipment. Depending on where you are going and how long you are staying, you may want to pack replacement filters and instructions for use,

and also request in advance information about power supplies during your trip and at your destination.

The devices also are suitable for flight. The airline should be contacted in advance for information about taking the device onboard in carry-on baggage or using it during a long-haul night flight.



Hygiene

The cleaning and care of the device and accessories are important in the continuous use of treatment and the service life of the equipment. The mask covers the face or part of it for several hours while the patient sleeps. While in direct contact, it picks up contaminants.

Therefore, all components of masks from Löwenstein should be cleaned to prevent the problem of transferring the contaminants to the skin on subsequent nights.

Nearly all parts, including mask body and cushion, forehead cushion and support, headgear clips, can be washed by hand in lukewarm water and neutral detergent or in the dishwasher up to 65 degrees Celsius. An exception is made for the headgear, which must be washed

by hand in lukewarm water. As a rule, the headgear has to be washed just once per week. The tube can be rinsed with a mild soap and plenty of clean water. If an interior pressure measurement tube is in use, it should be closed before cleaning.

The device can be wiped clean with a slightly moist cloth. Even more important in the cleaning process is the regular replacement of the filters. The cleaning instructions from the manufacturer, which are in the Instructions for Use, should always be followed.

Our Tips on Living with Treatment



Hospital Stays

You are normally allowed to take along and use your device during a (long) stay in the hospital. Prior to surgery or a hospital stay, you should inform the treating physician and nursing staff of the presence of sleep apnea and should have all findings on hand in case they are required. Then any treatment or medication can be adapted for you and complications can be prevented. An unfavorable effect on respiratory function can come from certain medications administered before, during or after an operation.

Warning! When sleep apnea goes untreated, the patient has an increased risk of having respiratory and cardiovascular problems while under general anesthesia. If you are not sure that you suffer from sleep apnea, talk to the treating physician responsible for the hospital unit.



Self-management of Treatment

You can manage your sleep apnea treatment yourself with the help of several apps and programs for your smartphone and computer.

Does the mask fit well? Do you use your device long enough? You'll find the answers to these questions and other information about your treatment and sleep quality in the digital therapy diary. There you can conveniently display your complete therapy data over the course of treatment, obtain information about the quality of your sleep, generate a printer-friendly therapy overview for different periods, and much more.

Several different types of digital therapy diaries are available. Some do not upload the data to the Internet but store them only locally, for example, on a computer where they are processed. Examples are **prisma JOURNAL** or **prisma APP** which can be used with Löwenstein products. The **prisma APP** lets you transmit your data to your doctor or device dealer.

Other digital diaries store data in a cloud, where they are accessible anytime and anywhere. Our **prisma CLOUD** also offers a telemedical option for Löwenstein products. It can be used in cooperation with the treating physician.

Sleep well and stay informed.



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