How to tolerate CPAP therapy for your Sleep Apnea

by

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Chapter 1

What this book is and what it isn’t

In this book I am going to share some of my knowledge dealing with most of the problems people have getting used to sleeping with their CPAP machine and mask.

I have almost twenty-five years experience in sleep disorders and their treatments, especially sleep apnea. Everyday I deal with people’s problems with their CPAP machines. I regularly conduct sleep disorders and CPAP support group meetings. And I also sleep with a CPAP machine. Thanks to my job, I get to try any and every new machine and mask when it hits the market.

This experience has translated into a 94% CPAP usage rate at three months among those who were tested in my lab and we ordered the CPAP versus a 76% compliance rate among those tested and treated in other, nearby, labs.

This book does NOT give medical advice.

Only YOUR doctor can give you medical advice. All professional advice, be it legal, financial, medical, psychological or otherwise, requires one-on-one communication with the professional and cannot be provided in a book or other publication.

Personally, I believe this one-on-one communication must also be face-to-face in the case of medical advice.

This book will make you more knowledgeable about your sleep apnea and about your CPAP machine. There are no guarantees in life, but this book should give you the information you need to solve some of your problems with your CPAP machine and mask.
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And for the problems you can’t solve yourself, it will give you the information you need to better communicate with your doctor, the sleep lab, and the therapist or technologist from the medical equipment supplier.

Also, it is my experience that many people leave the doctor’s office with a misunderstanding about their sleep apnea, not because the doctor didn’t do a good job of explaining, but because the doctor gave them so much information it was overwhelming.

We are going to first talk about sleep apnea because only by understanding what apnea is, and how it does its harm, can you understand what you are trying to accomplish with your therapy.

We are also going to discuss some of the alternative therapies for sleep apnea and what factors might make you a candidate for one of them. I will share with you why CPAP is so often the prescribed treatment and why your doctor seems to prefer CPAP over other therapies.

There is a lot of free information available about sleep apnea and CPAP usage. For the most part this information is not incorrect, but it is often incomplete or biased. In this book I will present a complete, and relatively unbiased, overview of sleep apnea and how to adjust to living with CPAP.

I do have one bias:

CPAP can be one of the most cost effective therapies in modern medicine but it will do you no good if you do not use it. So I believe there should be as much emphasis on using it as there is on ordering it in the first place.

It often takes effort and patience to acclimatize to the machine and mask. The goal of this book is to help.

I avoid unscientific explanations and unsubstantiated or irrational therapies. My goal has been to write to an intelligent reader who may not have specialized medical knowledge, but even the medical professional should find some helpful information.

First we’ll discuss sleep apnea, how it is diagnosed, how it does its damage and why it is bad for you, the problems commonly encountered adapting to CPAP therapy, and
what you can do about them. This section should help you understand your sleep disorder and help you better communicate with your doctor.

Then there is a question and answer section. This section covers information that just didn’t fit well into the narrative format and sometimes overlaps with the previous section.

Next, there is a glossary. This section can also be a very good source for specific information and understanding. I have tried to include all specific terminology used in the book.

Finally, there are several appendices.

The first gives some helpful hints for obtaining quality sleep. The second is a questionnaire we sometimes use to help people decide if they might need to be evaluated for sleep apnea. The third is a form we use to give patients the results of their sleep studies. The fourth tells you a little about me and the fifth is the acknowledgments.
Chapter 2

What is sleep apnea?

The word “apnea” means to not breathe, or to stop breathing, and “sleep apnea” means to stop breathing in your sleep.

By definition, in the sleep disorders field, we do not count an apnea unless it is at least ten seconds in duration, but it can be significantly longer. For most people the average apnea is between about 18 and about 25 seconds. This can vary greatly.

The diagnosis of sleep apnea as a sleep disorder refers to stopping breathing repeatedly during the night.

The severity of your apnea....

To be diagnosed with sleep apnea, the definition specifies that you must stop breathing five or more times per hour of sleep. Sleep apnea is classified as mild, moderate or severe based on how frequently you stop breathing.

- Mild: 5 to 15 times per hour of sleep
- Moderate: 15 to 30 times per hour of sleep
- Severe: more than 30 times per hour

“Wouldn’t I know it if I stopped breathing?” you ask.

The simple answer is: “Usually not, but sometimes.”

So, what happens when you stop breathing in your sleep?

This is a somewhat complicated and involved question which we will get more into later. But for now, the immediate effect is that it disturbs your sleep making it less restful.
In the long term, however, sleep apnea has serious implications for your heath. Let’s take a minute and talk about the apnea itself.

In the sleep lab, we classify each and every time you stop breathing as one of three types of apnea. Although the relative percentage of each type is of interest to your sleep doctor, it usually matters little to you, the apnea sufferer.

**What kind of apnea do you have....**

The three types of sleep apneic events are:

- Obstructive
- Central
- Mixed

Obstructive sleep apnea is, by far, the most common type seen in the sleep disorders center and, if you are reading this book, is probably the type of sleep apnea you have been diagnosed with.

Obstructive sleep apnea occurs when the airway collapses or “obstructs” as you try to breathe in. Thus the name. Throughout this book, anytime “sleep apnea” is mentioned without further clarification, it is a safe assumption that we are referring to the obstructive variety.

Think about it. In order to pull air through you nose or mouth and down into your lungs, you must create a negative pressure with your chest. If you pull too hard the airway can collapse, just like a straw in a milkshake.

After the air flows through your nose, which is semi-rigid, it moves inside your skull, which is definitely rigid, as the nasal passages make their way to your throat. Below your throat, the trachea, popularly called the “windpipe”, has rings of cartilage to keep it rigid.

In between, in the area known as the pharynx, through which both food and air must pass, the tissue is soft. It is in this area that the airway can collapse.

Obstructive sleep apnea is far more than a mere “plumbing” problem, however. If it were just plumbing, then surgical correction and/or weight loss would have a
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very high success rate, which they don’t. Among the contributing factors to obstructive sleep apnea are:

- Overweight/Obesity
- Facial structure and anomalies
- Tissue elasticity
- Sleep stage and/or position
- Respiratory control and/or respiratory muscle factors
- Nasal congestion and/or allergies
- Cardiac status

Obstructive sleep apnea syndrome is often abbreviated OSAS and refers to five or more obstructive events per hour of sleep.

Central sleep apnea occurs when you simply hold your breath in your sleep, not trying to breathe at all. There are several situations that can result in a central apnea, including simply no need to breathe at that time because you have sufficient oxygen in your blood.

We will discuss some of these causes of central sleep apnea later when we consider the problems you can have on your CPAP machine.

Central sleep apnea syndrome is abbreviated CSAS and refers to five or more central events per hour of sleep.

A mixed apnea is, as the name implies, partly central and partly obstructive. In fact, the definition of a mixed apnea is one that begins as a central apnea but becomes obstructive. At first you simply hold your breath but when you try to breathe, the airway collapses and obstructs.

At the present time, there is not a disorder called mixed sleep apnea syndrome as they are usually seen in patients with obstructive sleep apnea and account for a percentage of the events. The term mixed apnea refers, therefore, to the classification of an individual apnea.
Other terms related to your apnea....

A few other terms you might hear in describing your sleep apnea include:

- Hypopnea
- Complex sleep apnea
- Respiratory event
- Cheyne-Stokes respiration (CSR)
- Respiratory event related arousal (RERA)
- Upper airway resistance syndrome (UARS)
- Hypoventilation
- Sleep disordered breathing
- Desaturation, Saturation, “Sats”, or “Desats”

Hypopnea has been called a “partial apnea” and occurs by the same mechanism as an obstructive apnea but the airflow is not completely blocked. As a practical matter, for our purposes a hypopnea can be considered the same as an apnea.

Of course, there is a technical definition of hypopnea which specifies how much the airflow must be obstructed and how much the oxygen in the blood must decrease.

Regardless, moving too little air to supply your brain and body with oxygen is essentially as bad as not moving any air. Your sleeping brain very quickly senses that your airflow is blocked, whether completely or partially.

Complex sleep apnea is a combination of obstructive and central sleep apnea. Unlike a mixed apnea in which both central and obstructive characteristics occur in a single apnea, complex sleep apnea occurs when some of the apneas are central and others are obstructive. Complex sleep apnea, therefore, refers to the classification the patient’s sleep apnea syndrome.

As you might expect, there is a specific, technical definition of complex sleep apnea syndrome which specifies how many must be central and how many must be obstructive to consider it complex. We won’t concern ourselves about this technicality, either.

The expression “respiratory event” is often used generically to include any apnea (whether obstructive, mixed or central) or any hypopnea.
Cheyne-Stokes respiration, often abbreviated CSR, is a specific pattern of central apnea in which the airflow gradually diminishes until it stops and then gradually again increases to normal. CSR is a special case, often associated with heart failure, and we will not discuss it in depth.

Sometimes, as the airway begins to collapse but before the airflow diminishes enough to qualify as an apnea or hypopnea, the person will arouse enough from sleep to restore the airflow. The resulting sleep disturbance is referred to as “upper airway resistance syndrome” or UARS.

The sleep disturbances or brain wave “arousals” associated with respiratory events, or near events as in UARS, are sometimes referred to as “respiratory event related arousals” or RERAs.

Sometimes these arousals may result in a leg jerk that might be counted as a “periodic limb movement” resulting in a secondary diagnosis. When this occurs on the night of the CPAP trial, it has been called “CPAP kick” and probably needs no further treatment.

Hypoventilation refers to shallow breathing, so shallow as to result in accumulation of carbon dioxide in the bloodstream. The most common cause of this in the sleep lab setting is obesity.

All of the various types of sleep apnea, as well as RERAs and UARS, snoring, and hypoventilation are collectively referred to as “sleep disordered breathing” or SDB.

During a sleep study, the oxygen level in the blood is monitored using an instrument called a “pulse oximeter” which uses a light beam to determine what percentage of the total oxygen carrying capacity of the blood is actually carrying oxygen.

Blood cells with oxygen attached are bright red. Blood cells without oxygen are dark red. Using a light, red filters, and photocells, the oximeter measures the amount of bright red and dark red light that is transmitted through your finger. By comparing these, it can calculate the percentage of each.

This is referred to as the “saturation” or “sat” of the blood’s oxygen carrying capacity. It is expressed as a percentage and, in a normal, healthy individual will be in the 96 to 97 percent range. It should not be confused with an arterial blood gas, ABG, which may have similar values.
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When the oxygen saturation falls during a respiratory event, it is referred to as a “desaturation” or “desat” and is expressed as the number of percentage points it falls. Thus, if the saturation is 96% while you are breathing and drops to 90% due to an apnea, the desaturation, or desat, is six percentage points, but may be stated as “six percent” (even though that is not exactly correct).

How much you will desat with a particular respiratory event is a complex multifactorial function but, in general, severely obese individuals and people with lung disease, such as COPD, will desaturate more.
Chapter 3

What are some of the Health effects of sleep apnea?

As we alluded to earlier, the consequences of having sleep apnea can be divided into short term and long term effects, however, for this discussion we will talk about those effects caused by disruption of your sleep, which are mostly the short term effects, and those caused by the apnea itself, which are largely the long term effects.

Sleepiness....

Most of the consequences of disrupted sleep are intuitively obvious. If you don’t sleep well then you will be tired, sleepy and unrested the next day.

In fact, “excessive daytime sleepiness” or EDS, technically referred to as hypersomnolence, is traditionally recognized as the cardinal symptom of sleep apnea.

But not everyone gets sleepy and not everyone who is sleepy actually knows it!

  For example, it is not uncommon for someone to deny sleepiness during the day but on closer questioning to discover that she, or more typically he, drinks two or more pots of coffee during the day. And studies have shown that many nightshift workers fall asleep on the job without even realizing it.

  And many people do not distinguish between the feeling of sleepiness and the feeling of tiredness.

Besides the obvious inconvenience and unpleasantness of such sleepiness caused by sleep apnea, the major associated problem is safety.

  In one study, drivers with an untreated diagnosis of sleep apnea were found to be twice as likely to have an auto accident over the next five years as the general population and NINE TIMES as likely as those whose sleep apnea was treated.
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One could infer from this study that there are many cases of undiagnosed sleep apnea in the general population, and this has been supported by epidemiological studies.

**Memory and concentration difficulty....**

Another consequence of disturbed sleep is memory and/or concentration difficulty. This is because sleep, actually a specific stage of sleep, is important in storing information in long term memory. And that stage of sleep is particularly disturbed by obstructive sleep apnea.

**Longer term effects....**

There are also consequences, usually longer term, caused by the sleep apnea independent of its effect on sleep. Before we go into these, we will digress a little to talk about what happens when you stop breathing in your sleep due to **obstructive** sleep apnea.

Remember, as stated above, obstructive sleep apnea occurs when you essentially suck your throat closed and obstruct your airway. But, think about it, nothing will make you panic quicker than having your air cut off.

When that happens you will get an immediate surge to fight for your breath. This is the “fight or flight” reflex, commonly referred to as a “surge of adrenalin”, and scientifically referred to as “sympathetic activation” or “sympathetic nervous activation” or SNA.

And, although it is a great response when you are caught in an alley with a mugger, it isn’t a good response when you are trying to sleep because ..... 

The “fight or flight” response is just that. It prepares you to fight or run away by increasing the force and rate of your heart’s contractions, increasing your blood sugar, etc. For many people with moderate to severe sleep apnea, their heart is working harder when they are asleep than when they are awake.

And that is the way obstructive sleep apnea does much of its damage!
People often focus on the reduced blood oxygen that occurs after they stop breathing. But, a normal, healthy, not overweight, middle-aged or younger adult, probably cannot hold his or her breath long enough for the blood oxygen drop significantly. There is a reason for this but it’s beyond the scope of this book.

So....

The fight or flight response associated with sleep apnea is independent of the oxygen level and is related to your brain determining that your airway is blocked. If the oxygen drops, it’s just “icing on the cake”, another confounding factor making things even worse.

With this understanding of obstructive sleep apnea, what are some of the health consequences that we commonly see that can be traced to the apnea *per se*? These include:

- Headaches, especially in the morning
- High Blood Pressure or Hypertension
- Congestive Heart Failure
- Recurrence of Atrial Fibrillation/Flutter
- Increased risk of heart attack or myocardial infarction
- Increased risk of stroke
- Poor control of blood glucose (sugar) in diabetics

All of these effects are due, wholly or in part, to the sympathetic nervous activation (SNA), the “fight or flight” response, associated with obstructive sleep apnea.
Chapter 4

Who should be tested for sleep apnea and how is it diagnosed?

Sleep apnea is a very insidious disorder. Frequently the apnea sufferer has no idea that he or she has a sleeping problem. Instead, she or he attributes the symptoms to aging or weight or being “out of shape” or maybe to some other medical condition such as diabetes, depression, or low thyroid levels.

The person with sleep apnea often considers himself a “champion” sleeper, saying that he can sleep all night then go right back to sleep after breakfast.

Who....

Appendix II gives a questionnaire we sometimes use to help people decide whether they should talk to their doctor about being evaluated for sleep apnea. In more general terms, you should be tested for sleep apnea if you:

- Snore or have been told you stop breathing in your sleep
- Tired or sleepy during the day, or you need a lot of caffeine to keep going during the day
- Have high blood pressure and/or have had a heart attack or stroke
- Wake up multiple times during the night
- Have trouble with concentration or memory
- Have had a recent, unexplainable weight gain
Some people have sleep apnea without snoring. So if you don’t snore but have one or more of the listed symptoms for no apparent reason, evaluation for sleep might be informative.

The only sure way to diagnose sleep apnea is with a sleep test. There are two basic types of sleep tests.

**How: home studies....**

In-home sleep tests are now approved for insurance coverage. These have the advantage of being less expensive and the convenience of sleeping in your own home.

The disadvantage is that most of these tests are unable to determine when you are awake versus when you are asleep. So breathing irregularities that are normal while awake, such as swallowing or speaking, might be misinterpreted as apnea.

Published guidelines recommend in-home studies only for people with a high probability of having sleep apnea without significant comorbidities, such as heart problems. Unfortunately, it is the presence of these comorbidities that constitute a high probability of sleep apnea.

Quality control standards for in home sleep studies call for them to be regularly compared to laboratory based studies.

Another form of in-home “sleep test” that has been around for years is simple oximetry. It has often been championed by the DME companies as a marketing tool.

This is not considered a sleep study by accepted criteria, has all the disadvantages mentioned above for the in-home sleep studies with the added disadvantage of having no measure of breathing airflow.

**How: lab based studies....**

Sleep lab based sleep studies are considered the “gold standard” of sleep evaluations.

The studies are attended by a sleep technologist who monitors the testing and records observations throughout the entire night. The standards specify the training and
certification of the technologist and call for one tech for every two test subjects under normal conditions.

Six channels of EEG data, along with eye movements and muscle tension, allow the determination and staging of sleep. This assures the “sleep” in sleep apnea.

Two channels of airflow using different technologies are recorded. Respiratory effort is recorded, both chest and abdomen, as is oximetry. With this data, respiratory events can be precisely defined and classified. Sleeping position is also monitored and the apnea/hypopnea index is determined by position.

There are two basic approaches used by sleep labs in diagnosing sleep apnea and initiating CPAP. These are referred to as “split night” and “two night” protocols and there is a legitimate debate among the proponents of each.

The split night protocol calls for a baseline recording period, up to about two hours, to document sleep apnea, followed by a CPAP initiation period to determine the optimal CPAP pressure.

The two night protocol calls for an entire night of recording to document, and determine the severity of, sleep apnea. This is followed by a full second night to initiate CPAP and determine the pressure setting.

The split night has the advantage of only one night away from home and, consequently, lower cost. The disadvantage is that sometimes people have trouble returning to sleep after starting the CPAP.

Even if they fall asleep quickly, there is less time to determine the needed CPAP pressure than with a two night approach.

The two night protocol has the advantage of determining the severity of sleep apnea across the entire night. Many people get worse as the night progresses.

I once had a rather dramatic example of this. The gentleman had a high probability of sleep apnea so we planned a split night study. After two hours of sleep, he had had no apnea or hypopnea so we did not begin CPAP. By morning he had over six hundred events!
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And the two night protocol, with the advantage of an entire night, will typically result in at least two more hours to optimize the CPAP pressure setting.

There are published papers which show that a split night is suitable for finding a single CPAP pressure setting for controlling the apnea. I prefer a two night protocol because I find it better for finding a range of pressures for an auto-adjusting machine which, according to my data, results in better compliance.

Now let’s turn our attention to some of the treatments for obstructive sleep apnea....
Chapter 5

Treatments for sleep apnea

By far, the most effective treatment for obstructive sleep apnea, and the only treatment that is consistently effective, is “positive airway pressure” or PAP, which is the topic of this book. This is because, as discussed in Chapter 2, obstructive sleep apnea is a multifactorial disorder and all other treatments focus on a single contributing factor.

If this single factor, such as the length of the palate or position of the jaw, is the only or even the major factor causing a particular case of sleep apnea, then treatment of this cause is likely to be effective.

If on the other hand there are, as commonly happens, multiple contributing causes for the apnea, then treatment of any one of them is unlikely to be very effective.

Why PAP works so well....

PAP has the advantage of treating the mechanism of the sleep apnea rather than the cause. It is, therefore, consistently effective at controlling the apnea but does not cure the apnea.

A good analogy is hypertension, high blood pressure, which is controlled but not cured by medication. If you stop taking your blood pressure medicine, the pressure will return to an elevated level. Treatment of sleep apnea with CPAP is like that.

Of course, it would be preferable to cure your sleep apnea and some people are able to do this, especially with surgery and/or weight loss. I will discuss the factors contributing to the success or failure of other sleep apnea treatments when these are covered in a later chapter.
The types of PAP....

Let’s return to our discussion of PAP. There are several variations:

- Continuous Positive Airway Pressure or CPAP
- CPAP with pressure relief: “Flex” or “EPR”
- Auto-adjusting CPAP or “AutoPAP” or “APAP”
- Defunct versions of CPAP such as “Demand” PAP or “DPAP”
- Bilevel PAP, often referred to as “BiPAP” which is actually a brand name
- Other specialized forms such as BiPAPautoSV, BiPAP AVAPS, BiPAP S/T, VPAP Adapt SV, etc.

Throughout this book I will use PAP to refer generically to all the variations. However because CPAP, in all its versions, is by far the most common and many of the problems are common to all versions, often when I use the term CPAP the statement is equally applicable to the other forms of PAP, such as BiPAP or VPAP.

All versions of PAP deliver positive air pressure through a facial interface, commonly referred to as a “mask” even when it doesn’t remotely resemble anything you would think of as a mask. People often confuse problems with their mask with problems with their machine.

It is necessary to determine where the problem is before it can be resolved.

There are probably forty or fifty different masks on the market, with more every year. There is a mask that will be comfortable for you. It might not be the first one you try, or the second one, or even the third or fourth one. We will discuss masks later.

Common alternative and adjunctive treatments....

Other common treatments for sleep apnea include:

- Oral appliances, usually custom fit by your dentist
- ENT and maxillofacial surgeries, such as:
  - Uvulopalatopharyngeoplasty, known as UPPP or UP3
  - Laser Assisted Uvulo-Pharyngeoplasty, or “LAUP”
  - The “Pillar procedure”, Somnoplasty, etc
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- Nose specific surgeries such as rhinoplasty, turbinectomy, etc.
- Less common procedures such as maxillomandibular or mandibular advancement, hyoid suspension, tongue reduction, tracheostomy, etc.
- Other Nasal treatments
- Nose sprays or drops
- Nasal expander strips
- Weight loss
- Diet and exercise
- Medications
- Bariatric surgery
- Positional training to avoid sleeping on the back
- Lifestyle changes
- Avoiding alcohol and/or sedating medications
- Avoiding/quitting smoking

Less common alternatives....

Other, less common and/or outmoded treatments include:

- Singing/voice exercises
- Playing some musical instruments
- Medication

This ebook focuses on adjusting to and tolerating PAP because it is the most common and, by far, most effective treatment. We will cover many of the pros and cons of the other treatments, and how to determine if they might be right for you, in a section near the end of the book. Several of them are good adjuncts to your CPAP therapy.

Let’s now return to the various versions of PAP.
Chapter 6

Types of PAP machines

All versions of PAP work by maintaining an open airway with positive air pressure. In simplest terms, they consist of a blower or compressor, a delivery hose, and a “patient interface” or mask. They differ in how that pressure is managed both for effectiveness and for comfort.

Straight, old fashioned, CPAP....

First, there is straight CPAP: continuous positive airway pressure. This is the most basic of PAP treatments and is virtually unchanged over the past quarter century. It delivers a constant level of positive air pressure throughout the breathing cycle.

Unfortunately, many people find it difficult to exhale against this pressure, particularly at higher pressure settings. And, there is probably no reason to maintain as high a pressure during exhalation as during inhalation.

Some insurance companies, especially with their “HMO” products, require that you use one of these primitive machines for a period, often three months, before allowing you to try a more sophisticated machine. This is poor care, and poor business, as studies have shown that the sooner the patient adapts to the CPAP, the more likely he or she is to use it long term.

In days past these CPAP machines were noisy and the output air was uncomfortably warm. Today, even the simplest CPAP machines run quietly and coolly.

Bilevel PAP machines....

Next to come along were bilevel machines which vary the pressure according to the phase of the breathing cycle. “BiPAP” is a trademarked name for one brand of bilevel
machine but is often used generically. Bilevel machines are also sometimes referred to as BPAP.

Although bilevel machines have some similarities to ventilators, and the more sophisticated versions are useful in treating some of the more complicated variants of sleep disordered breathing, they are not usually notably, if any, better than the modern CPAP machines for obstructive sleep apnea.

Unfortunately, nothing works perfectly and people sometimes complain that the bilevel machine wants them to inhale while they are still trying to exhale. Or, conversely, they find that it does not detect when they are ready to inhale and fails to increase the pressure.

This is probably the greatest shortcoming of bilevel machines in the treatment of obstructive sleep apnea.

**Expiratory relief....**

The next level of sophistication, expiratory relief, came along around 2003 or 2004 to make exhalation easier. Respironics developed the original version and called it “C-Flex” and was followed later by the ResMed version called “EPR” for expiratory pressure relief.

Both of these are trademarked names and, in spite of the similarity to EPR, we will use the expression “expiratory relief” to refer to this feature generically. Expiratory relief differs from bilevel PAP in a very important way.

**The difference between bilevel and expiratory relief....**

Bilevel machines reduce the pressure upon expiration and keep the pressure low throughout the expiratory phase. They then increase the pressure back to a higher level upon inspiration.

The standard version waits until it detects that you are trying to breathe in before it increases the pressure. There is a timed version that increases the pressure to the inspiratory level after a defined time interval.
By contrast, CPAP machines with expiratory relief reduce the pressure at the beginning of the expiratory phase of the breathing cycle. They then gradually and smoothly return to the higher inspiratory pressure before the end of exhalation. Thus they avoid the problems sometimes associated with bilevel PAP machines.

**Auto-adjusting PAP....**

The next level of sophistication, auto-adjusting machines, has been in development for many years. These machines are supposed to automatically adjust the pressure level based upon the person’s need. The current units from Respironics and ResMed also have expiratory relief.

The concept is that the pressure requirement varies from night to night and during the night depending upon sleeping position, stage of sleep, and other factors.

Of course, to believe that these machines can reliably detect respiratory events with 100% accuracy, distinguish between obstructive and central events, and adjust the PAP level appropriately, is naive. But all is not lost.

If the testing in the sleep lab revealed a range of pressures, all of which appeared to adequately control the breathing, but which differed in sleeping position and sleep stages, then an auto-adjusting machine can be limited to work within that range.

Such an approach can result in significant comfort improvements and make the PAP therapy more tolerable. And the newer auto-adjusting machines are much better at detecting and classifying respiratory events.

By definition, however, an auto-adjusting machine will result in less than perfect control of the respiration because respiratory events must occur for it to detect...
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before it can raise the pressure. And the machines all periodically lower the delivered pressure to determine if you still need that level.

Thus, if an auto-adjusting machine controls the respiratory events completely it is because the very lowest pressure was sufficient.

PAP versions for special situations....

There are several specialized versions of PAP designed for specific, less common, more complicated types of sleep disordered breathing. These go by such names as:

- BiPAP S/T which includes a timed backup
- BiPAPautoSV for servoventilation BiPAP
- BiPAP AVAPS for Average Volume Assured Pressure Support
- VPAP ST which has a timed backup rate
- VPAP Adapt SV a servoventilation system

And, of course, others. We are not going to discuss these in detail, however, many of the tolerance problems we will discuss are applicable to these situations.

And an obsolete PAP version....

Finally, there are obsolete and defunct versions of PAP.

The most notable, only because at least one insurance company (BC/BS of Florida) is so out of touch that, as of the time of this writing they still reference it in their coverage literature, is “demand positive airway pressure” or DPAP.

Other than the mentioned insurance company, I last heard of this version sometime in the early 1990s. The concept was that it would quickly increase pressure to prevent respiratory events but, in practice, it simply awoke the patient. We will not discuss this version further.
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Chapter 7

Masks or patient interface

There are many different versions of masks, versions that:

- cover the end of the nose
- cover the whole nose
- fit into the nostrils, sometimes called “nasal pillows”
- cover the nose and mouth
- cover the mouth and also fit into the nostrils
- cover the whole face
- deliver the air into the mouth, like a scuba mask
- are held by the mouth and fit into the nose
- are made of cloth

People new to CPAP often confuse the mask with the machine itself. They will come into the sleep lab and say they want “the one that goes in the nose” while actually discussing the machine. They are also unaware that there are a number of masks from different manufacturers that fit that description.

Try several masks....

There is no reason a mask from one company cannot be paired with the CPAP machine from another company. Sometimes the medical equipment company will have a contract for a particular brand of CPAP machine and supplies, in which case they may not stock other makes of masks.

This is especially true for the big national equipment companies. I think this is a mistake, both from a business perspective and for patient care. The equipment company should be able to provide you with whatever mask is comfortable enough for you to tolerate.
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As a practical matter, the pressure delivery through the various masks is consistent. That is not to say there are no differences but that the differences are usually minor enough to be addressed by your doctor’s clinical judgement.

People sometimes say they feel like they’re getting more pressure through the nasal pillow type of mask, even though the machine setting is the same. In fact, the pressure is unchanged but the flow is increased.

This happens because the nasal pillows deliver the pressure only into the nostrils, causing them to expand. Masks that cover the nose deliver the same pressure to the outside of the nose as well as into the nostrils and, therefore, don’t cause this expansion of the nostrils.

There is at least one (and I think only one) mask that delivers the pressure into the mouth like a scuba mask. Although the manufacturer claims that the pressure needed to control your apnea with this mask is the same as for a nasal mask, it is probable that this mask will differ somewhat in the required pressure.

Your doctor may require that the medical equipment company get permission, or even a prescription, from him or her for any change in mask. This is done to be sure the doctor’s clinical judgement is not circumvented.

Sometimes the equipment company will have a policy that requires the doctor’s order for any mask change. This is especially the case for the national companies if you want a mask brand they don’t normally stock.

Other doctors will allow the equipment company to make any mask changes necessary as long as they communicate it to him or her for followup at your next appointment.

Either approach is reasonable.

Some examples of masks, which illustrate some of the variety:
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The ResMed Activa mask uses an air cushion to provide a good seal without strapping it on tightly.

The ResMed Activa

The Respironics Total Face mask

The Optilife mask from Respironics
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People often ask which mask is best.

Masks are a very personal thing, there is no “best” mask. The best mask is the one that fits comfortably with an acceptably small leak. A good analogy is shoes: the shoes that are best for you are not necessarily the same that are best for me.

I do not endorse any specific mask. These masks are shown here only to illustrate some of the variety and not as an endorsement of these particular models.
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This selection of masks represents only a small fraction of the masks currently available. To show every model of mask from every manufacturer would have put a mask picture on almost every page of the book.

The Easylife mask

The Comfort Gel nasal mask

Liberty Hybrid mask

The hybrid type mask covers the mouth and has nasal “pillows”
Chapter 8

Common problems associated with PAP usage

There are a number of common problems and challenges to adapting to and sleeping with CPAP. These include:

- Difficulty exhaling or unable to exhale
- The mask is uncomfortable, leaks, or causes sores on the face
- Unable to sleep all night with the CPAP
- Pulling the mask off during the night
- Opening the mouth or mouth breathing
- Difficulty falling asleep or staying asleep with the CPAP mask on
- Nasal congestion and/or a “runny nose”
- Ear or Sinus pain or discomfort
- Nasal obstruction; deviated septum

Other common problems include:

- Waking suddenly not breathing with the CPAP mask on: central sleep apnea
- Chest pain or discomfort
- Claustrophobia: can’t stand having the mask on the face
- Condensation in the hose, commonly called “rain out”
- Stomach bloating, belching/burping, or passing gas in the morning
- Air blowing in the eyes or out the ears
- Mask tickles or irritates the nose
- Air fills the cheeks then escapes through the mouth
- Other sleep disorders, either coincidental or caused by the sleep apnea
If you have one or more of these problems, first be comforted that they are common problems and that many people have overcome them. I have often found that just knowing it’s common can help.

**Reasons to not use PAP....**

There are also some contraindications to using CPAP and some conditions in which CPAP should be used with caution. These include:

- Pneumothorax, a condition of air in the chest cavity but outside the lungs
- Heart failure that is acute and decompensated
- Epistaxis, a bloody nose, that is significant and massive, or a history of such
- Middle ear infection or perforated ear drum
- Respiratory distress syndrome or acute respiratory failure
- Sinusitis that is acute and severe

Your doctor will be aware of these contraindications and will not have prescribed CPAP without appropriate consideration of the risks and benefits. Some of the specialized versions of PAP have been developed especially for some of these conditions.
Chapter 9

Solutions to those problems

The solution to some of the problems are clear cut but some solutions are counter intuitive, exactly the opposite of what you might expect.

**Difficulty exhaling or unable to exhale**

This is a very common problem, especially at higher pressures. The first solution to this was bilevel PAP and, even today, some professionals consider bilevel to be the best solution.

Around 2004, the expiratory relief option was added to CPAP. As mentioned above, expiratory relief differs from bilevel in that the pressure returns more gradually to the inspiratory level and without waiting for the user to begin inhaling. I have generally found the expiratory relief to be a better choice.

Auto-adjusting PAP may also be easier to exhale against because the pressure may be lower for much of the night.

**Mask is uncomfortable, leaks, or causes sores on the face**

As discussed above, there are many, many options for masks and the one you will find comfortable may not be the one someone else finds comfortable. The most obvious cause of an uncomfortable mask is the “wrong” mask for your face.

This is not an uncommon problem with some of the low priced insurance policies that mandate your CPAP machine and mask be shipped to you. Or with a medical equipment company that would provide such poor service.
Medicare, unfortunately, has been considering going to this approach for a number of years and, as I write this, the concept is back on the table.

The bottom line is that you should have the benefit of a face-to-face meeting with a sleep tech or respiratory therapist to properly fit the mask and instruct you on the operation and care of your machine.

This is where I show my bias: why would an insurance company, or Medicare, want to pay for a piece of equipment but provide it with such poor support that a significant percentage of users will find it intolerable? The easiest way to cut cost is to reduce service.

The tech or therapist should fit the mask to you in as nearly a normal sleeping situation as possible. You should be lying down, not sitting up.

If you wear dentures and take them out at night, the mask should be fit with your dentures removed. If you sleep with rollers in your hair, the mask should be fit with rollers in your hair.

The next most common reason for mask discomfort is adjusting the headgear too tightly, usually to prevent leaks. The mask should not be so tight that it causes sores, or tenderness, on the face.

Usually the mask is strapped on overly tight in an attempt to stop a leak. Often this is done by the user even with a mask that was properly fit by the therapist. Sometimes it is done to compensate for a poor mask choice or fit.

What is important to realize is that most modern CPAP machines can compensate for a minor leak. In fact, the leak is likely to disturb the user long before the CPAP machine cannot handle it.

Interestingly, the most sophisticated CPAP machines, the auto-adjusting machines, are somewhat less tolerant of leak because it can deceive their event detection program. This may limit the utility of an auto-adjusting CPAP for some people.
Unable to sleep all night with the CPAP

This problem is so common that we probably shouldn’t even list it as a problem but as a normal stage in adapting to CPAP. If after two to four weeks of sleeping with the CPAP mask and machine, you find that you make it only about three or four hours before you just have to pull it off, don’t give up, you may be on your way to CPAP satisfaction.

Yes, some people have absolutely no problem adapting to CPAP. They wake up after their night in the lab asking how soon they will get their machine, and sleep through the night with it from the very first night. Although this is not uncommon, it is certainly not the norm.

There is a normal, physiologic reason for waking after a few hours unable to return to sleep with the CPAP.

Under normal circumstances, most people will get their deepest sleep in the first three hours or so (the first couple “sleep cycles”). During this time it is often easy to tolerate a new sleeping condition, such as a mask on the face, simply because the drive to sleep is so strong and the sleep is so deep.

After this period of deep sleep, it can be challenging to stay asleep with any new condition.

You should determine if there is a specific reason for you waking up such as nasal congestion, water in the hose or mask, a leaking mask, or even noisy neighbors. I can’t make any recommendations on how to handle the neighbors, but I will address the other, CPAP related, problems.

Warning:

If you have uncontrolled high blood pressure, have severe heart disease such as congestive heart failure, a malignant arrhythmia, multiple heart attacks, or are at high risk for stroke, it is very important that you adapt to your PAP as quickly as possible so you can sleep through the night with it.

Do not take this section to mean that you do not need to work toward sleeping all night on your machine, rather, understand that many people struggle at first. Talk to your doctor about the problems you are having sleeping with the PAP. He or she may offer you a sleeping pill for a couple weeks to help you adapt.
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Pulling the mask off during the night

There are two main reasons you might pull your mask off while asleep during the night. Here I am referring to pulling the mask off without knowing it so that you find it lying on the floor in the morning with no memory of pulling it off. The two reasons are:

- Mask discomfort
- Nasal congestion

We have discussed mask discomfort in other sections and all the remedies apply here as well. Generally, if the mask becomes uncomfortable during the night without being notably uncomfortable at the beginning of the night, the most likely causes are:

- A poorly fitting mask
- A mask that is adjusted too tightly
- The mask shifted on your face

We’ve already discussed the issues of mask fit and tightness. Shifting on the face may be caused by a poorly fitting mask but may also be caused by your pillow.

There are pillows available that have been specifically designed with contours to avoid shifting the CPAP mask. Talk to your medical equipment company about this, they may carry them in stock.

Nasal congestion is less obvious as a cause of pulling the mask off, but it is very common, especially if you are opening your mouth during the night.

Think about it. You can’t get enough air through your nose because it is congested. You don’t know you’re congested, because you are asleep, but you do feel something on your face. Your instinctive response will be to pull it off.

The first thing to do for nasal congestion during the night is to increase the humidifier setting, either turning the temperature up or selecting a higher humidity range depending upon the model.

Probably the most common reason for nasal congestion on CPAP, assuming you didn’t have a nasal congestion problem without CPAP, is mechanical irritation of the nasal tissue from the cool, dry air. Your doctor may refer to this as “vasomotor rhinitis”.

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Often the nasal congestion begins after you open your mouth during your sleep. Sometimes adjusting the humidifier as suggested will solve this problem but you may need a chin strap to help you keep your mouth closed. Fortunately, as you learn to sleep with the CPAP pressure, you may not need the chin strap on a permanent basis.

If adjusting the humidifier, and maybe using a chin strap, does not solve the problem of pulling the mask off, and it does seem to be related to nasal congestion, talk to your doctor about the appropriateness of using a nasal steroid spray.

**Do not** just try a steroid spray not prescribed to you. If your doctor does recommend the nasal steroid, use it on a nightly basis for best results, not just intermittently.

Of course, if you have a deviated nasal septum, it will take even less congestion to give you a problem and the doctor may suggest surgical correction.

**Opening the mouth or mouth breathing**

One of the most common, and challenging, problems associated with CPAP usage is mouth-breathing. Breathing through the mouth is very common in untreated obstructive sleep apnea.

As the airway obstructs and the airflow diminishes, the apnea sufferer instinctively opens his or her mouth to get more air. Although the obstruction is in the pharynx, not at the mouth, opening the mouth helps by reducing the resistance he or she must pull against.

With less resistance, less forceful inhalation is necessary reducing the tendency for the airway to collapse.

This habitual pattern often continues when starting CPAP, and is particularly annoying because the air rushes out the mouth, sometimes with enough noise to disturb the bedpartner.

Most CPAP machines can adapt to the increased flow of air in through the nose and out the mouth, which to the machine is a leak, and maintain the prescribed pressure.
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Ironically, the most sophisticated CPAP machines, the auto-adjusting machines, are more susceptible to leak, including mouthbreathing, than the simpler models.

For many people, as their sleeping brain learns that they actually get more air by keeping the mouth closed, they stop breathing through the mouth. So, give it some time, maybe with the help of a chin strap, and see if the mouthbreathing stops on its own.

In the meantime, experiment with the humidifier setting, generally increasing the setting for more humidity or heat. As discussed above, sometimes nasal congestion begins with mouthbreathing, but as the nasal congestion progresses and it becomes harder to pull air through the nose, the mouth opens even more.

One of the physiologic functions of the nose is to warm and humidify the air on its way to the lungs. By the time the air reaches the lungs, it must be warmed to approximately 98.6°F and humidified to 100%.

When the mouth opens and an abnormally high volume of air flows through the nose, the nose simply cannot keep up and responds with congestion.

A common misconception is that a humidifier is unnecessary in areas, such as where I live on the Gulf Coast, where nighttime humidity is in the upper 90’s and temperatures in the mid 80's during the summer.

But almost everyone has air conditioning now and so the actual ambient indoor conditions, the conditions you are sleeping in, are temperatures in the 70’s with a humidity of about 50%.

Similar to nasal congestion, nasal obstruction caused by a deviated septum or other anatomical abnormality can result in mouth breathing. If you suspect this is your problem, discuss it with your doctor and consider seeing an ENT specialist.

In this case, the resistance to airflow is constant but is simply too great to force the air through and the mouthbreathing was probably noticed before starting CPAP. A surgical approach is usually necessary.

As discussed above, a chin strap may be necessary to help keep the mouth closed and should be the next option tried. The chin strap may only be needed for a few months as you learn, in your sleep, that you get more air without opening your mouth.
Sometimes, as a last resort, changing the pressure may help. It is not always obvious whether the pressure should be increased or decreased so it’s essential that it be done only upon your doctor’s order.

Raising the pressure may force sufficient air through the nose to eliminate the drive to open the mouth. Or it may result in increased mechanical irritation and nasal congestion, increasing the tendency to open the mouth.

On the other hand, reducing the pressure may reduce the irritation and congestion and, therefore, the drive to open the mouth.

**Difficulty falling asleep or staying asleep with the CPAP**

This is a very common problem with three basic causes.

- Unfamiliarity with the experience
- Mask discomfort
- Too much or too little pressure

We have all experienced difficulty falling or staying asleep after making a change in our sleep environment. This can be as minor as not using a fan in the fall after using it all summer or rearranging the furniture. It can be as major as moving halfway around the world.

Sleeping with a mask on your face may be one of the most dramatic changes in sleep environment you will ever experience. And this can manifest itself as insomnia.

One “trick” in learning to sleep with CPAP is to prepare your machine and fit the mask to your face at bedtime but not actually put it on until after you first doze off. This, of course, is dependent upon you waking briefly but many people drift in and out of sleep before finally remaining asleep for an extended period.

After you become used to sleeping with the CPAP, you should be able to fall asleep easily with it on.

Like the insomnia associated with other changes in the sleep environment, time will often solve the problem as you become used to the new conditions. Your doctor may prescribe a sleeping pill for up to a couple weeks to help with this.
By the way, your sleep doctor may refer to your insomnia as DIMS for “difficulty initiating and maintaining sleep” or by just the component of insomnia you have. This may be abbreviated as DIS or DMS. Other expressions are “sleep initiation insomnia” or “sleep maintenance insomnia”.

Mask discomfort is a major challenge to falling asleep and staying asleep, but mask discomfort should be addressed even if it doesn’t cause insomnia. Talk to your doctor and the therapist at your medical equipment company about this.

The mask manufacturers often give the medical equipment companies replacements for any mask you reject so don’t be shy about asking for a replacement. The bottom line is, you should not be expected to sleep with an uncomfortable mask.

Some equipment companies act like they are doing you a favor by exchanging masks in the first thirty days. Some, especially online companies, even charge you for the “insurance” that you can exchange your mask. This is ironic since they get a refund on the rejected mask!

Either too much or too little pressure can make it difficult to sleep. Especially in the case of sleep initiation, the sleep techs and respiratory therapists have a tendency place the blame on too much pressure, however, it can be just as hard to fall asleep with too little pressure.

Generally, too much pressure will lead to insomnia due to difficulty exhaling. As discussed above, the first thing to try is more expiratory relief. Too little pressure will lead to insomnia due to feelings of “air hunger” or struggling to breathe in.

Talk to your doctor and the therapist from the equipment company about any insomnia problems you feel might be caused by pressure. The therapist may discuss this with your doctor but will need the doctor’s order to make any change.

**Nasal congestion and/or a “runny nose”**

One of the most common problems people face in learning to sleep with CPAP is nasal congestion and/or rhinorhea commonly called a “runny nose”. Often they will complain that the CPAP machine gave them a “cold” or a “sinus infection” and sometimes this is even after the very first night.
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We’ve already discussed nasal congestion associated with simple mechanical irritation but, for completeness, will have a brief review in this section.

As discussed above, your nasal congestion may be due to vasomotor rhinitis. This is caused by the mechanical irritation of the nasal mucosa by the relatively cool dry air delivered from the CPAP machine.

Of course, the air from the CPAP is neither cooler nor drier than the room air. But it is delivered under pressure and can, therefore, result in a significantly greater flow volume. This is particularly a problem if you open your mouth so the increased airflow moves through your nose and out your mouth.

If this is the source of your congestion and/or rhinorhea, try the suggestions made above in the sections on opening your mouth and on pulling the mask off. Specifically, try increasing the humidifier setting (either heat or humidity level depending upon the model) and adding a chin strap if necessary.

There are other sources of nasal congestion and rhinorhea.

First, there is a daily or circadian rhythm to nasal symptoms. Normally, there is a nocturnal or nighttime increase in inflammatory cells in the nasal mucosa. This leads to a naturally occurring, nightly increase in nasal congestion and rhinorhea.

You may have been aware of this even before starting CPAP. Many people notice it as nasal congestion and/or a runny nose in the morning for awhile after getting up. I certainly do.

What can you do about it?

The first thing to try, after discussing it with your doctor, is to flush the nasal mucosa with saline (salt water) before going to bed. Saline nasal spray is available at the drug store as an “over the counter” product. Spray into your nose and then blow your nose thoroughly, repeating several times.

If this doesn’t help, you may need a nasal steroid spray. Talk to your doctor about this, it will require a prescription. It is not appropriate for all people, so whatever you do, don’t use someone else’s prescription.
Ear or Sinus pain or discomfort

Air trapping in the sinuses or middle ear can result in pressure and/or pain. And the pain can be intense. This is generally due to inadequate pressure equalization caused by congestion and can usually be managed.

You should discuss this problem with your doctor. Usually, your doctor will first try medication such as a nasal steroid spray. All the cautions about using nasal sprays discussed above pertain to this situation also.

Depending upon your exact circumstances surgery may be indicated.

It may be possible to lower your CPAP pressure, or use expiratory relief to attain a lower average pressure. This may result in less air trapping and discomfort or pain.

But remember, your doctor selected the pressure for a reason and it may not be possible to lower your prescription. Do not try to change your pressure yourself.

Nasal obstruction; deviated septum

Nasal obstruction refers to restricted airflow through the nose due to anatomical factors such as a deviated septum. It is constant, day and night. And it can absolutely limit, or totally prevent, your ability to tolerate CPAP.

By contrast, nasal congestion occurs from swelling of the nasal mucosa and varies throughout the day and night and from time to time. Many things can contribute to this including allergies and mechanical irritation.

As discussed, nasal congestion may respond to reducing the contributing factors or to nasal steroids. Of course, you may have both a nasal obstruction and nasal congestion and their effects will be additive.

Generally, nasal obstructions are amenable to surgical correction. Correction of a nasal obstruction is, arguably, the most effective surgery commonly performed in the treatment of obstructive sleep apnea.

Again, the nose has the narrowest cross sectional area of the entire respiratory system and thus is a point of high resistance. Any increase of cross sectional
area at this point may thus result in a greater reduction of resistance than elsewhere.

Whether a nasal obstruction is your problem and whether there is a reasonable surgical option is something only your doctor can answer. Be sure to discuss the probability of success, and what is considered a success, as well as the risks with your doctor.

Waking suddenly not breathing on CPAP

A common problem encountered in the early stages of CPAP usage is the experience of waking suddenly, aware that you are not breathing. This is usually associated with a central apnea, a cessation of breathing effort.

Sometimes the emergence of central apnea during your initial CPAP trial in the sleep lab limits the pressures that can be used. If there are enough events your apnea may be reclassified as “complex” sleep apnea.

There is some debate concerning the cause of these central respiratory events. It may be an example of, or similar to, the Hering-Breuer reflex which limits the extent of inspiration. The reflex is triggered by the stretch receptors in the chest which essentially tell the brain that the chest has expanded as far it should. Or it may be due to a gradual shift in the bicarbonate level in the blood to compensate for the nightly increase in carbon dioxide. Either way, the effect will usually diminish with continued use of CPAP.

You may not have experienced central events while in the sleep lab, or they may have been rare and you were unaware of them. Once you have your CPAP home, however, these may occasionally become so long in duration as to awaken you suddenly from an otherwise sound sleep.

Fortunately, this problem will normally resolve itself in time but it can certainly be troubling when it occurs.

Chest pain or discomfort

Chest pain or discomfort caused by using CPAP is usually chest wall pain related to the expansion of the chest by the pressure. In simplest terms, you haven’t been breathing
in deeply in a long time and the mechanical stretch of the chest wall results in discomfort or even pain.

This may occur along with the stretch induced central events described above and, similarly, should resolve itself within a couple weeks. However ....

**Warning:** Chest pain or discomfort can also be related to more serious conditions involving your heart and/or lungs. If you have chest pain when you use your CPAP, especially if it is severe, talk to your doctor about it immediately.

**Claustrophobia**

One of the concerns most commonly expressed when first faced with the prospect of CPAP is claustrophobia. Often this is founded on a fear of suffocation when something is on the face. Certainly, a fear of being unable to get enough air is reasonable for a person suffering from obstructive sleep apnea.

Fortunately, there are some things you can do to help alleviate the claustrophobia associated with CPAP usage, and most the time we have been able to overcome the problem.

If you are worried about claustrophobia, try these suggestions:

1. The first thing to do, before you even try a CPAP, is to remind yourself that it will be supplying air. So suffocation is not really a concern. Remind yourself of this over and over, multiple times per day. Try to change your mindset.

2. Work with the sleep lab, prior to your CPAP trial, to find the best mask for you. You want to determine which factors contribute the most to your claustrophobia.

There are a number of considerations:

Does the size of the mask on your face contribute to your claustrophobic feelings? Or, does the headgear holding the mask contribute more? Is the tightness on your face the problem? Is it the feeling of the mask? Or is it the sight of the mask when you open your eyes?
How to tolerate CPAP therapy for your Sleep Apnea

There are many mask designs out there and each of these problems have been addressed by one of them.

Remember, there are masks that cover all of your nose, masks that cover just the end of your nose, masks that cover your nose and mouth. There are masks that go in your nostrils, and masks that cover your mouth and go in your nostrils.

There is a mask that blows in your mouth. There are masks with complicated headgear, masks with minimal headgear, and a mask with no headgear and that you hold in your mouth. There is a cloth mask. There are masks that seal to the face with minimal tightness.

If the mask itself is the source of your claustrophobia, there is a mask that will probably be more tolerable.

3. Next, you want to work on acclimation to the mask. Hold your mask in your hand, without the headgear, and bring it up to your face, holding it in position for a few seconds to a minute or so. Do not hold it so long that you start to panic. This can be done while you are distracted with something else such as watching television and should be done several times per day. The more often you do this the faster you will adapt. And you might never adapt if you only do it once a day.

Do this with the CPAP machine connected and turned on so that it is supplying air. Set the expiratory relief at the maximum. If the rush of air causes you to panic, remove the hose from the mask but leave the machine turned on. If you have to disconnect the hose, be sure to do it at the mask not at the machine.

You want to continue doing this until you reach the point that you are comfortable holding the mask on your face indefinitely. It may take you several days or even a week or two to reach this point, but keep trying.

If you had to disconnect the hose to get to this point, it is now time to reconnect the hose and resume the process until you are able to again hold it on your face, indefinitely, but now while breathing against the pressure.

Next, you want to actually put the mask on with the headgear. Again, do this while awake and do not leave it on until you start to panic. Do it multiple times a day until you are able to wear it, indefinitely, while distracted.
Only at this point are you ready to start trying to sleep with the mask. If you have not yet had your CPAP titration trial, it’s time to return to the sleep lab for another night.

4. Your doctor may offer you a tranquilizing or sedating medication to help you during the adaptation phase. This is a perfectly reasonable approach.

But remember, these medications usually make your respiratory events last longer so your ultimate goal should be to adapt to the CPAP machine and mask and discontinue the medication.

Condensation in the hose

Condensation of water in the hose, often referred to as “rain out”, is a common problem with humidified CPAPs. The heated water chamber, combined with the extra surface area of a corrugated hose, makes an great still.

You might be able to turn the heat down on your humidifier. On some newer units the temperature is not directly set by the user, but these units have less of a problem with condensation because the setting is for a humidity level rather than a temperature or heat setting.

And, besides, you selected that humidifier setting based on comfort.

There are three things you can do to reduce the problems associated with condensation:

1. Place your CPAP unit on the floor next to the bed, without any low points in the hose, so that any condensation tends to run back down the hose into the humidifier chamber.

2. Insulate the hose with a cloth sleeve. These may be available from your medical equipment company or you may have to make one yourself.

If your mask orients the hose such that it runs down from your face, the hose can be placed under your bedcovers to accomplish the same thing.

This is particularly successful if the CPAP machine is on the floor, as suggested above.
3. Try a heated hose. Your CPAP machine may have a heated hose option from the manufacturer. There is also an aftermarket heated hose that can be used on any brand of CPAP. This is an effective, but more expensive, solution and may not be covered by your insurance.

**Stomach bloating, belching/burping**

Bloating and belching is a common, and challenging, problem with CPAP. There are no sure fixes for this but things you can try include:

1. Reduce the pressure: If you have an expiratory relief machine, increasing the relief to the maximum will reduce the average pressure and may reduce the bloating.

   Similarly, this may be less of a problem with a bilevel machine and bloating may be considered a “CPAP failure” to qualify for a bilevel machine for insurance purposes.

   Your doctor may approve a lower CPAP setting for you but, remember, he or she picked the pressure for a reason and a lower pressure may not be effective for you. Talk to your doctor about the problem.

2. Sleep on your side. You may find that you have less bloating on your side than on your back and it may be different on one side than the other. Experiment with sleeping position.

3. Raise your head, either by blocks under the bed or on multiple pillows. This may result in less air trapping by the stomach. It may also reduce your pressure requirement resulting in lower pressures if you are on an auto-adjusting machine.

**Air blowing in the eyes or out the ears**

Air blowing in the eyes is usually a mask fit problem. You may need a different mask design, a different mask size, or just an adjustment of your mask. Talk to the therapist or sleep tech at the medical equipment company.
The therapist will need to fit the mask to you while you are in your normal sleep position (eg. lying down, on your back, side, and/or stomach) and sleep condition (eg. dentures in or out, hair rollers, face creams, etc.).

Another way that you might experience air blowing into your eyes is through the nasolacrimal, or tear, ducts which normally drain tears from the eyes into the nose. Talk to your doctor about it if you think this is the source of your problem.

Lowering the pressure may reduce, or eliminate, this problem but, again, the pressure was selected for a reason and a lower pressure may not be effective for you. There is a mask, the “total face” mask, that covers the whole face, including the eyes, which should solve the problem.

Air blowing out your ears may mean you have a perforated eardrum or “tubes” in the ears. Talk to your doctor and an ENT evaluation may be needed.

**The mask tickles or irritates your nose**

Mask irritation can be as simple as mechanical irritation or it can be the result of either contact or allergic dermatitis.

Mechanical irritation may require a change in mask type or fit. A common example of this problem is irritation of the inner surface of the nose by a pillow type mask. This problem is also common with poor mask fit or adjustment.

A dermatitis may respond to an over-the-counter hydrocortisone cream applied to the face at the site of the dermatitis or to the mask itself. Be sure to follow the instructions on the package and tell your doctor about it on your next visit.

Some people have found relief using a lubricating and moisturizing jelly such as Vaseline® or K-Y®, however, these may be incompatible with some mask materials.

**Air fills the cheeks then escapes through the mouth**

This is a common problem, sometimes referred to as the “chipmunk” problem. Some people find it amusing but some find it quite annoying because it often wakes them up.
How to tolerate CPAP therapy for your Sleep Apnea

The basic cause of the problem is air entering the mouth from the pharynx because of an inadequate seal.

Keeping the mouth moist may help but may not completely control the problem. This works by creating a gasket like effect around the tongue. Try a higher humidifier setting.

Also, placing the tongue firmly against the roof of the mouth and the back surface of the front teeth may help.

Other sleep disorders

If you have another sleep disorder, either coincidental or developed secondary to your sleep apnea, this can be a challenge to getting used to sleeping with CPAP. It can also limit the benefit from your CPAP that you perceive.

Some of the more common sleep disorders that you may have in addition to your sleep apnea, and which may limit your ability to tolerate CPAP or the benefit you experience from it are:

1. **Inadequate sleep hygiene**: This refers to the sum total of behaviors that negatively impact your quality of sleep. Often this is a result of inappropriate responses to the poor sleep quality caused by the sleep apnea.

   Counterproductive behaviors commonly adopted by sleep apnea sufferers include:

   - Dozing in the evening before bedtime
   - Excessive caffeine consumption
   - Random napping during the day
   - Excessive time in bed attempting to get “enough sleep”
   - Evening alcohol consumption attempting to reduce sleep fragmentation, but which actually increases the sleep fragmentation and worsens the sleep apnea

2. **Shiftwork**: Shiftworkers, because of the disruption of their “biological clock”, often experience light and fragmented sleep and/or sleepiness or fatigue during their waking hours. CPAP can further increase the sleep fragmentation for shiftworkers increasing the time it takes to develop adequate sleep quality on the machine.
Furthermore, sleepiness and/or fatigue are common symptoms of sleep apnea. Any residual sleepiness or fatigue that is due to the shiftwork, rather than the apnea, will limit the perception of improvement often described by new CPAP users.

3. **Hypnotic (sleeping or anxiety pill) dependency**: Many sleep apnea sufferers have developed a dependence on sleeping medications prior to being diagnosed with sleep apnea. This often occurs when the person describes poor sleep to his or her doctor in terms that, to the doctor, sound more like insomnia.

Sleeping medications will worsen sleep apnea especially by prolonging the respiratory events. This can usually be controlled by the CPAP but may affect the required pressure.

Sleeping medications also frequently result in nonrestorative sleep, resulting in sleepiness or fatigue the next day and limiting the benefit that a new CPAP user might perceive.

Fortunately, many doctors today will no longer prescribe sleeping medications without first having a sleep lab evaluation.

4. **Psychophysiological insomnia**: Psychophysiological insomnia refers to a specific classification of insomnia in which psychological arousal leads to physiological arousal which results in insomnia.

It is commonly associated with stress, but is particularly challenging when the insomnia becomes the stressor which leads to the psychological arousal.

This type of insomnia usually manifests itself as a sleep onset insomnia and can severely limit the ability to fall asleep on CPAP especially when first starting out. It may also contribute to a sleep maintenance insomnia.

Your sleep doctor should be familiar with all of these sleep disorders, as well as the eighty some-odd other sleep disorders, and will have recommendations depending your specific circumstances. It is important that you discuss all your sleep problems with your sleep specialist in order to maximize tolerance of and benefit from CPAP.
Chapter 10

Frequently Asked Questions

Do I have to use my CPAP all the time, even when I nap?

The simple answer is: “Yes, you should.” Remember that the damage caused by obstructive sleep apnea occurs because of the repeated sympathetic nervous system activation and this will occur on even a short nap.

What if I have a cold?

Unfortunately, if you are congested with a cold you may not be able to tolerate your CPAP until you are better. To make matters worse, the congestion from a cold will likely increase the severity of your sleep apnea.

Changing to a full-face mask that covers both the nose and mouth may work. A nasal decongestant spray may help, and this is an appropriate use for one. But check with your doctor beforehand. These sprays are contraindicated for people with high blood pressure and that includes many people with sleep apnea.

Is it noisy?

Years ago, CPAP machines were noisy, CPAP masks were noisy and, to make matters worse, the air was hot. Today’s machines are very quiet. And they’ve learned how to vent the air quietly from the mask.

So any noise is usually just associated with the changes as you breathe in and out, and that is usually minimal. Of course, if you choose an older design of mask for reasons of comfort, it may produce more noise as the air vents out.

Oh, and the machines no longer run hot, either.
What about travel, can I take it on an airplane?

Modern CPAP machines are small, light, and come with a convenient carrying case, usually with a shoulder strap. Most people carry their CPAP machine with them as a “carry on” when flying and, yes, the TSA is familiar with CPAP. They will probably ask you to open the case and let them inspect it.

Just in case, it might be helpful to have some paperwork showing that the machine is actually yours. This could be the billing paperwork you get from the medical equipment company or a copy of your sleep study recommending a CPAP. I’ve never actually heard of anyone needing this.

If you are traveling to a place at a higher or lower altitude than where you usually use your CPAP machine, it will have to be adjusted in order to deliver the proper pressure. Some new machines can do this automatically but some require you to make the change.

This information should be in the manual supplied with your machine but check this out with your medical equipment company to be sure.

Do I need an adapter to use it in Europe?

Most modern CPAP machines are able to automatically analyze the power source, both voltage and frequency, and adjust. Be sure to verify for your specific machine. You may need an adapter for the plug itself.

Can I take it camping with me?

That depends on what you call camping. If you’re going backpacking in the Andes, probably not. But if you are doing the typical camper trailer, sure. You need to be sure that if you use a generator or inverter that the waveform is acceptable. There are line conditioners that will assure this for you.

There are compact battery powered CPAPs available. At this time none of these machines have expiratory relief. And the battery charge is really only good for one night so you will need a way to recharge it. There are also batteries available for common home CPAP machines but, again, keeping them charged may be a challenge.
How often should I get a new mask?

Your CPAP mask will deteriorate with time and your insurance will probably buy you a new one on a regular basis. This may be as often as once every three months or as rarely as once a year. If you have really cheap insurance, it may not cover replacement supplies.

Even if your mask has not worn out at the time the medical equipment company says you qualify for a replacement, I suggest you get one as a backup. It can be very unpleasant if your mask breaks right at bedtime one night.

You might also want to have a backup mask of a different design from your regular mask in case you get a pressure sore at some point.

Your insurance will also replace your hose and filters on a regular basis although possibly not as often as the mask. Be sure to have a backup hose.

Will I become dependent on, or addicted to, the CPAP?

No, the CPAP machine does not cause dependence and if your sleep apnea resolves because of weight loss, surgery, or any other reason, you will be able to discontinue the CPAP. But be sure the apnea is resolved by getting another sleep study.

On the other hand, some people become so used to the CPAP machine as part of their normal sleeping environment that it does take them awhile to get used to sleeping without it.

Will the CPAP machine cure my sleep apnea?

No, the CPAP machine controls your apnea but does not cure your apnea.

Prior to starting CPAP, many people have significant swelling of the palate caused by the physical trauma associated with their snoring and apnea. For some of these people, use of the CPAP will reduce this swelling.
If they stop using their CPAP, they may experience a few days in which their snoring and apnea are not as bad as they were before starting the CPAP. Unfortunately, this is a short term effect.

**What if I go into the hospital, do I take my machine with me?**

This is a question that will have a different answer depending upon who and where you ask. In most cases, you should continue to use CPAP while a patient in the hospital. Sleep apnea is a known risk factor for post-surgical complications. But...

Hospital safety regulations may not allow you to use your own CPAP machine while an inpatient. On the other hand, the hospital may not have enough CPAP machines of their own to accommodate all the patients with diagnosed sleep apnea.

You should discuss this with your doctor, but even your doctor might not be aware of some of the hospital regulations, so be sure to also clear it with the hospital admissions.

**Do children have sleep apnea?**

The simple answer is yes but the definition of sleep apnea is different: one obstructive event per hour.

That’s not to say that we don’t see children with very high AHIs, only that the definition of the minimum AHI to be considered sleep apnea is lower. And I’ve seen children as young as twelve with hypertension and even heart failure.

Obstructive sleep apnea can significantly and negatively impact a child’s school performance and behavior. Fortunately, many cases of obstructive sleep apnea in children, maybe even most cases, can be improved or cured with ENT surgery and/or weight loss.

And controlling the sleep apnea with CPAP, or improving or curing it with surgery, along with appropriate sleep hygiene, can go a long way to help with weight loss in obese children.
Is sleep apnea related to Sudden Infant Death Syndrome?

Central sleep apnea is very common in newborns, reflecting an immature respiratory control system, but is probably not related to SIDS (Sudden Infant Death Syndrome).

There was a paper published in the early 1970s which purported to link SIDS to sleep apnea. The paper, however, had several shortcomings. It described a very small number of cases, the cases were selected and not random, and cases that suggested the contrary were excluded.

Further studies failed to support the link.

I can’t feel the pressure during the night, is it still working?

Usually yes. It is not uncommon to adapt to the pressure to the point that you barely notice it during the night. Most often it is still blowing at the correct level.

Your medical equipment company should be able to check the pressure with a manometer and you should ask them to do this if you have any doubt. But, of course, that only means the pressure is correct at that time. A data download may also be reassuring.

How do I clean the hose and mask and how often?

Your paperwork should give recommendations for your mask, hose and humidifier. Generally, they recommend a mild detergent followed by a thorough rinse. Sometimes vinegar is recommended but it is incompatible with some masks, so check the instructions, and be sure to rinse very well.

DO NOT use bleach.

It is essential that your mask and hose dry completely every day after use, and after washing, to prevent the growth of mold and/or bacteria.

Your mask will absorb oils from your skin which will speed deterioration. It is amazing how filthy some people let their masks get. You should wash your
mask often enough to prevent this. This can vary from daily to once a week, depending upon the mask and your skin.

**Is it really necessary to use distilled water in the humidifier?**

All manufacturers recommend distilled water for the protection of the humidifier. If a significant portion of the water evaporates during the night, and you have relatively hard water, the deposited salts can have an insulating effect on the heating element and could potentially cause damage.

If you don’t use the heat, have soft water, and most of it is left in the morning, then you might get away with tap water. Some people have certainly done this without problems. I cannot, however, recommend this.

**Can I sleep on my stomach?**

Yes, but there are two potential problems you might encounter, both concerning the mask. First, you might find that your mask is easily displaced when sleeping on your stomach.

Second, if you bury your face, and CPAP mask, in your pillow you might block the exhalation ports. Since you will still be getting plenty of air from the machine, you might not arouse immediately.

But, with the ports blocked, you will be rebreathing your carbon dioxide which will probably result in headaches during the night or in the morning. This could be especially problematic if you have severe lung disease.

Talk to your doctor if you think this could be happening to you.

**How long should it be before I can feel the difference?**

That varies. Some people wake up after their first night on CPAP and say it was their best night of sleep ever. Other people take several weeks, or even months, before they really feel better. I had one gentleman who took an entire year to adapt to CPAP.
Generally, the worse your AHI and/or desaturations, the more quickly you will feel the benefits. But if you have another significant sleep disorder, or other health problems, it may take longer even with a high AHI.

If I lose weight will I be able to get off the CPAP?

Maybe. If you are significantly overweight, you should probably try to lose weight. It may or may not result in a “cure” for your sleep apnea but, regardless, in will probably result in better control of your apnea or a lower pressure requirement.

As I discussed earlier, if you are young and have no anatomical anomalies such as a deviated septum, you have a better chance at resolving your apnea. But there are no guarantees.

What should my “leak” numbers be?

That depends on the kind of machine you have. The leak is determined by measuring the amount of air moving through the machine. Some of that air is the normal airflow through the exhalation ports.

Some machines report the total airflow, some of which is normal. Other machines subtract the expected normal airflow through your mask and report the difference. That depends on the brand of machine you have.

A machine that does not include the exhalation airflow in the reported leak must have data on the model mask you use. If your mask is not in its database either because your mask is a newer design or because you use a different brand of mask, your leak values will be erroneous.

All machines can tolerate a reasonable amount of leak and, for some machines, that is quite high. The bottom line is: read the manual for your CPAP machine and use the leak values as just one of several parameters in evaluating your progress.
Why does the machine continue to run even after I turn it off?

Some modern machines continue to run at a low level after being “turned off” to dry the humidifier, mask and hose and to cool the motor. It should stop completely after a brief period.

Will sleep apnea make my insurance premiums go up?

Maybe. There are really two issues: medical insurance and life insurance.

With the pending changes in medical insurance, it is hard to predict how your premiums will be affected. If you have individual insurance, it is possible that it may increase your premiums.

Life insurance is another matter. When applying for a new life insurance policy it is standard practice to review your medical history and, since sleep apnea is known to shorten life expectancy, it is probable that your premium will be affected.

On the other hand, considering the prevalence of undiagnosed sleep apnea, if your apnea is adequately controlled with CPAP you may actually be at lower risk than someone among the general, untested population.

Will having sleep apnea affect my CDL?

The DOT is well aware of sleep apnea and the associated safety risks. The FAA and USCG are as well. They have published standards and requirements and your sleep doctor will be aware of these. The doctor conducting your DOT, FAA or USCG medical exam will probably defer to your sleep doctor for clearance.

This means that you must be proactive. Be aware that, like many medical facilities, sleep labs often have a waiting list that may be weeks long. There will also be other delays in addition to the actual waiting list.

Contact your medical examiner in advance to find out if you will need to have clearance from the sleep lab. If so, have him or her, or your family doctor, refer you to the sleep lab for reevaluation.
Will my health insurance cover my CPAP machine?

Most insurance policies cover CPAP machines for diagnosed sleep apnea. They will have specific, published guidelines outlining the diagnostic requirements (lab accreditation, physician qualifications, etc.) and the severity thresholds required for coverage.

Many insurance companies follow the Medicare guidelines which, at the time of this writing, cover CPAP for AHIs above 15..... and for AHIs between 5 and 15 if there are certain comorbidities such as: hypertension, heart failure, heart attack or stroke, hypersomnolence, and others.

A few medical insurance policies, especially those from businesses and agencies that “self insure”, have sleep apnea exclusions.

Is this sleep apnea thing a scam?

No. Diagnosis and treatment of sleep disorders in general, and sleep apnea in particular, has the potential of being one of the most cost effective of medical treatments.

In recent years there has been accumulating data linking sleep with a number of medical/health conditions including hypertension, heart disease, obesity, and others. There is also data indicating that sleep apnea is vastly underdiagnosed. This has resulted in rapid growth of the field of sleep medicine.

Are there some practitioners that are working beyond their expertise for their own financial benefit? Sure. This happens in any rapidly growing field.

There are times that someone with mild sleep apnea meets the prescribing guidelines even though their apnea is not a major part of their sleep complaint nor are they at significant risk due to their apnea. Unfortunately, because of legal risks, these people are sometimes pushed toward at least trying CPAP.

But the treatment of sleep disorders, including sleep apnea, with scientifically verified therapy is a valuable and beneficial field of practice.
Can I adjust my CPAP pressure settings myself?

You can but you should not. Although very rare, some patients will respond to CPAP therapy paradoxically. I have seen patients in the sleep lab simply stop breathing and precipitously desaturate when started on CPAP. Also, “blindly” changing your pressures may result in completely ineffective therapy.

Your doctor will use the data from your sleep study, his knowledge of your medical status, and his professional judgement in making any changes to your CPAP settings.
Chapter 11

Other treatments for sleep apnea

As discussed in Chapter 4, CPAP is the most commonly prescribed treatment for moderate to severe obstructive sleep apnea because it works, and it works consistently. Your doctor doesn’t want to waste your time and his or hers on treatments that “might” or might not work.

CPAP is also often prescribed for mild sleep apnea, maybe even too often. But, again, this is because it consistently works and every sleep doctor has had patients with mild sleep apnea who amazed him or her with how well they did on the CPAP, and how much they improved.

And, CPAP works consistently because it addresses the mechanism by which the apnea occurs, rather than the actual cause of the apnea. Nevertheless, there are alternatives to CPAP that sometimes cure the apnea and some that often bring improvement in the apnea and/or make the CPAP more tolerable.

Let’s discuss some of these now.

Other common treatments for sleep apnea include:

Oral appliances

Mouthpieces, often but not always fit by your dentist, are designed to reposition the lower jaw (mandible) and/or the tongue. They are often successful in reducing snoring and sometimes are effective in improving, or even fully controlling, sleep apnea.

Unfortunately, it can be difficult to determine who will benefit from an oral appliance. And, of course, the only sure way to know if it helped is to perform another sleep study adding to the expense.
How to tolerate CPAP therapy for your Sleep Apnea

Many of the appliances are custom fit to the wearer, and therefore expensive, and all of the appliances require purchase of the device before you can determine if it will be of benefit to you.

Are you a candidate for an oral appliance? Generally, you might benefit from an oral appliance if:

- your apnea is mild to moderate
- you are not significantly overweight or obese
- your apnea occurs mostly while you are on your back
- your chin is not very prominent

**Nose, Throat, and/or maxillofacial surgery**

Several types of surgery may cure sleep apnea or, more commonly, simply make the CPAP more effective and/or tolerable. We will cover a number of them later in this section but first let’s discuss some general principles.

It is important to remember that obstructive sleep apnea is usually caused by a combination of multiple factors and is not just a mechanical “plumbing” problem. If it were just mechanical then the ENT surgeon would be able to cure it with a high degree of success.

If you are significantly overweight, your apnea is moderate to severe, you are middle aged or older, and you have no major anatomical abnormalities such as a severely deviated septum or a significantly recessed chin, then it is unlikely that ENT or facial surgery will correct your sleep apnea.

It might, however, reduce the needed CPAP pressure and improve your comfort and tolerance.

But if you have mild apnea, are young, not overweight, have large tonsils and adenoids and/or a deviated septum, then there might be a good chance of a surgical cure for your apnea.

Only your ENT doctor can assess the likelihood of surgical success in your case, and only after a thorough evaluation including a fiberoptic examination of the nasal passages and the pharynx.
How to tolerate CPAP therapy for your Sleep Apnea

There are no guarantees in life and, unless you have an unusually dramatic airway abnormality, the doctor will give you the assessment in terms of probability of success. Be sure to ask him or her what would constitute a successful surgery. And be wary if the doctor seems too sure.

Some of the common surgeries are:

Uvulopalatopharyngoplasty, known as UPPP or UP3, consists of trimming the back edge of the soft palate, removing the uvula (the “hangy down” thing), and trimming soft tissue in the throat. It is very effective at controlling snoring, although the effect often diminishes in time (several years), but it is less effective at controlling sleep apnea.

It is done under general anesthesia (they put you to sleep), usually in the hospital, and can be very painful. Although extremely rare, people have been known to die from postoperative complications.

Sometimes people have trouble drinking, especially from a water fountain, after this surgery because the water, or other drink, comes out their nose.

Laser Assisted Uvulo-Pharyngeoplasty, or “LAUP” Is a multi-step procedure similar to the UPPP except it is done in a series of procedures, usually three to five, in the doctor’s office. By doing it in smaller steps there is no need for general anesthesia.

Many people say the pain is the same, just spread out over a longer period of time, and sometimes they don’t complete all the phases because of this. Like the UPPP it is more effective on snoring than it is on apnea and the snoring often returns.

The “Pillar procedure”, “Somnoplasty”, etc, are proprietary surgical procedures, meaning that a company developed an instrument or device which they sell specifically for the procedure and the name is trademarked.

Both of these procedures are more effective at controlling snoring than sleep apnea but in some cases of mild apnea, in a person who is not notably overweight, they may be sufficient.

The “Pillar procedure” consists of inserting little nylon rods into the soft palate to provide stiffness and reduce the vibration. The rods are inserted through a
needle and, because there is minimal cutting of the tissue, the pain is much less than with a UPPP or LAUP.

“Somnoplasty” consists of inserting a small needle into the soft palate and using radiofrequency energy to cook the tissue in the palate. The resulting scarring stiffens the soft palate and reduces the vibration. Like the Pillar procedure, there is minimal cutting of the tissue.

Nose specific surgeries such as rhinoplasty, turbinectomy, etc., can be among the most successful of surgical remedies for sleep apnea. In cases of mild to moderate apnea in a person who is not overweight, nasal surgery may even cure the apnea.

In other individuals the surgery may improve the apnea without curing it or reduce the CPAP pressure needed to control it.

The nose is the narrowest part of the entire respiratory system. This means that correcting even a minor abnormality, such as a deviated septum or enlarged turbinates, can markedly reduce the resistance to airflow.

A reduction in resistance means that less negative pressure is needed in the pharynx to pull adequate air through the nose.

From my own personal experience, I would describe this surgery as more miserable than painful.

Mandibular advancement, hyoid suspension, and tongue reduction are less common surgeries sometimes performed for sleep apnea.

A mandibular advancement consists of cutting the lower jaw (mandible) on both sides and advancing the chin slightly. Sometimes the upper jaw is also moved, making it a “maxillomandibular” advancement.

Together with the base of the skull, the mandible makes a bony ring through which the anatomical structures of the neck must pass. Since we all are born with the same structures, a smaller jawbone results in crowding of these structures.

Expanding the mandible improves the situation and can reduce the apnea. It is probably less likely to be effective in those who are overweight.
How to tolerate CPAP therapy for your Sleep Apnea

Although it sounds very dramatic, those who have had both a mandibular advancement and a UPPP tell me it is less painful than the throat surgery.

A hyoid suspension anchors the hyoid bone to the thyroid cartilage. The hyoid is a small, free-floating, “U” shaped bone which serves as the attachment of some of the muscles of the neck and tongue.

The theory is that by anchoring this bone there will be less tendency for the airway to collapse. It is effective in a very small percentage of people.

A tracheostomy is effective at controlling obstructive sleep apnea, and the only surgical treatment with a high degree of success in those who are obese. It consists of inserting a breathing tube into the trachea, the windpipe, which then opens at the base of the neck. The tube is capped during the day to allow normal speech.

This is a dramatic treatment with a high complication rate and is only appropriate for sleep apnea in cases that are immediately life threatening.

**Other Nasal treatments**

Nasal treatments such as nasal sprays and drops or nasal expander strips can be quite beneficial. They are likely to control apnea, however, only in borderline cases. Beware of using over-the-counter nasal decongestants because you can become dependant upon them.

As already discussed, a reduction of resistance in the nasal airway is effective because the nose is the highest resistance component of the respiratory system. Both nose sprays/drops and expander strips can reduce that resistance.

“Borderline” in this case does not necessarily refer to a low apnea/hypopnea index. Instead it refers to the tendency for the airway to close off enough to be considered an apnea or hypopnea.

Prescription nose sprays, such as the nasal steroid sprays, are preferred. They do not have their maximum effect until they have been used for several days so they should be used regularly.
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Over-the-counter nasal decongestants, by contrast, have an immediate effect but can have a “rebound” where the congestion gets worse, leading to dependence.

**Weight loss**

Losing weight can be effective at improving or even curing sleep apnea. And virtually everyone who is overweight and has been diagnosed with obstructive sleep apnea has been told to lose weight. But most will agree that is easier said than done, and there is a reason for this.

The likelihood that weight loss will cure your sleep apnea depends upon a number of factors: level of obesity at the start and the amount of weight lost, age and tissue elasticity, other anatomical features such as a deviated nasal septum or hypognathia, etc.

We have tested many, many people before gastric bypass surgery and after weight loss of 100 to 200 or more pounds.

Generally, with no significant anatomical anomalies those under about 35 years of age often found their apnea dramatically improved or even cured. While those over about 50 often continued to have significant apnea but the apnea was controllable with lower CPAP pressures.

Weight loss strategies include:

Diet and exercise are the standard recommendation for weight loss and certainly the preferred approach most of the time. But research in the past few years has shown that the weight management pathways in your brain overlap with the sleep regulation pathways.

This means that it can be very difficult to lose weight while your sleep is still disturbed by uncontrolled apnea and/or other associated sleep disorders.

Several medications for weight loss work by stimulating the “reward center” in your brain making you less inclined to seek food for such reward. This is the same way that smoking helps people lose weight and, like smoking, the weight loss can be hard to maintain when the medication is discontinued.
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Other medications help block the absorption of certain components of the diet, such as fat. These types of medications have problems of their own, for example: the “spotting” problem, and unless you change eating habits, the weight will come back when you stop.

Weight loss medications of the future will work on the body’s energy balance system itself and, therefore, may affect sleep as well.

Bariatric (weight loss) surgery can be effective for those who are very obese. There are several procedures that can be done from banding the stomach to a gastric bypass but none of them should be taken lightly.

The amount of weight loss varies from person to person and can be in the hundreds of pounds but some individuals eventually regain much of the weight.

Positional training

Changing your sleeping position, usually to avoid sleeping on your back, can also be beneficial in some cases, but it is only rarely an effective treatment for adequate control of the apnea. If your initial sleep study indicated your apnea was primarily in only one position, this can be a reasonable therapeutic approach.

For many, but certainly not all, people the apnea/hypopnea index (AHI) varies significantly by position and for most of these, it is worse when they on their back than when on their side. Some people are worse on their side.

But only a small percentage of people have an AHI on their back that is high enough to give them an overall diagnosis of sleep apnea while the AHI on their side is below the definition of sleep apnea (5.0 per hour).

In years past we tried very hard to get these people to keep off their backs as the simplest therapy for their apnea. The standard recommendation was to put a tennis ball in a sock and sew it to the back of the pajamas.

Unfortunately, it was not very effective because people would learn to pull their loose fitting pajama shirt around in their sleep to move the ball out from under them.
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So today, with more comfortable and tolerable CPAP machines and masks, whenever someone has apnea only on their back, and it is severe enough to give them a significant overall AHI, we make the tennis ball suggestion but also treat the apnea with the more effective treatment: CPAP.

We also make the tennis ball suggestion if the apnea is only on the back but not severe enough to give an overall AHI that qualifies as sleep apnea.

In either case, we also recommend an ENT evaluation for any case of positional sleep apnea.

Other lifestyle changes

Various behavioral changes such as avoiding alcohol and/or sedating medications and avoiding or quitting smoking are almost always recommended and sometimes can reduce the severity of the sleep apnea.

Alcohol and most sedating medications are respiratory depressants. That is, they reduce the drive to breathe. As obstructive sleep apnea is a multifactorial disorder, not just a “plumbing” problem, reducing the drive to breathe can increase the severity of the apnea.

Possibly more importantly, alcohol and sedating medications reduce one’s ability to arouse from sleep and it is the arousal that normally terminates the respiratory event. Thus....

Any sedating chemical including alcohol, sleeping medications, tranquilizers, or illicit “downers” will prolong the individual apneas and hypopneas.

The prolongation of the respiratory events will often result in a greater oxygen desaturation. The effect on the apnea/hypopnea index by these drugs, however, may be minimal.

The situation with smoking is more long term and, although you certainly should quit smoking, quitting has the effect of avoiding further damage more than of correcting prior damage. Smoking destroys tissue elasticity, effectively making you age faster.
Thus, the effect of smoking on the apnea/hypopnea index is similar to getting older which is to increase the index. Additionally, the effect of smoking on the oxygen exchange function of the lungs will usually result in greater desaturation with each respiratory event.

Less common, controversial, and/or outmoded treatments include:

**Music lessons and practice**

Exercises for the muscles of the throat, such as singing and voice exercises or playing certain musical instruments, have been tried with some success. The idea is to strengthen and tone the muscles in the pharynx and the concept has been around for many years.

Two recent studies looked at this approach, one using a musical instrument called a didgeridoo (probably any wind instrument would do as well) and one using exercises developed by a speech therapist.

Both studies were limited to people with mild to moderate apnea, and both excluded obese or severely obese people. And both mostly improved the apnea without actually curing it.

Although these studies are encouraging, there were some scientific limitations in the interpretation of them. Nevertheless, if you want to try this approach, it probably will do no harm and may help.

**NOTE:** If you have high blood pressure or a heart condition, especially congestive heart failure, consult your doctor before starting to play a new instrument.

**Medication**

Medication has been used in the past for the treatment of sleep apnea, but is rarely used today. The medications were either respiratory stimulants or REM sleep suppressants. Neither has been particularly successful.

Medications to stimulate respiration, either directly or indirectly have been used for both obstructive and central sleep apnea. They are marginally helpful, more
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so for central than obstructive apnea. They also have a tendency to disrupt the sleep.

Medications to reduce the amount of REM sleep have been used in treating obstructive sleep apnea. This is based upon the fact that obstructive apnea is often worse in REM than in NREM.

Implicit in this concept is the assumption that REM does not serve an important function, which is certainly not true. The REM suppressants used were antidepressants.
Chapter 12

Glossary

AASM: American Academy of Sleep Medicine, probably the largest and most well established professional sleep organization, formerly the American Sleep Disorders Association (ASDA) and, before that, the Association of Sleep Disorders Centers (ASDC).

ABSM: American Board of Sleep Medicine, the credentialing body for doctors working in sleep medicine from the early 1990's until the early 2000's, an outgrowth of the original credentialing by the predecessors to the AASM. The ABSM continues to maintain its certification list but all new certification of doctors is done through their primary specialty.

ACP: abbreviation for Accredited Clinical Polysomnographer, the original doctor level certification in sleep disorders.

ADAM Circuit: the original version of a “nasal pillow” style mask.

Adjustment Insomnia: insomnia caused by an acute, external psychological stressor such as loss or fear of loss; also referred to as transient situational insomnia, the definition requires that it be of limited duration and specifically associated with the external stressor.

AHI: the “apnea/hypopnea index” expressed as the total number of apneas and hypopneas divided by the hours of sleep, necessary because the total number would differ after a long night of sleep and a short night of sleep, also helpful in determining if there is a positional or sleep stage component to the problem.

APAP: abbreviation for “Auto Positive Airway Pressure”, a version of CPAP which adjusts the pressure to the current pressure needs. To do this it must increase pressure when respiratory events are detected and regularly test to determine if less pressure would be adequate. The reliability of the event detection is a concern.
Apnea: to stop breathing or to not breathe. To be counted as an apnea for the purpose of diagnosing sleep apnea, the airflow must decrease by 90% or more and must be a minimum of ten (10) seconds in duration.

Apnea of Infancy: a common phenomenon of central apnea, observed in newborns, and reflective of an immature respiratory control system. Not usually pathological.

Arousal: a shift in the sleep EEG to a lighter level of sleep, generally used to refer to short duration shifts that do not last long enough to change the sleep staging.

Arrhythmia: lack of rhythm, used to refer to an abnormal pattern in the heart’s electrical activity, the electrocardiogram (ECG or EKG).

Auto CPAP: a version of CPAP which adjusts the pressure to the current pressure needs. To do this it must increase pressure when respiratory events are detected and regularly test to determine if less pressure would be adequate. The reliability of the event detection is a concern.

BiLevel PAP: a version of PAP that provides one level of pressure during inhalation and a lower level during exhalation (see IPAP and EPAP), especially useful in the treatment of hypoventilation; sometimes referred to as BPAP; also sometimes inappropriately referred to by the proprietary name “BiPAP” even when not referring to that specific brand of bilevel machine.

Cataplexy: a sudden loss of muscle tone while awake, commonly observed in narcolepsy, believed to be an intrusion of the muscle relaxation normally seen in REM sleep into wakefulness.

Central apnea: an apnea in which there is no respiratory effort, no attempt to breathe.

Cheyne-Stokes respiration: a special subset of central apnea in which the airflow and respiratory effort wax and wane, that is the respiration gradually decreases until it stops and then gradually increases again to the normal level. Sometimes associated with heart failure.
Chin Strap: as the name implies, a strap under the chin to help hold the mouth closed and prevent mouthbreathing, can be as simple as a scarf but may be a specialized product from the medical equipment company.

Comorbidity: diseases, disorders and disabilities that coexist in a patient with a disease or disorder, such as sleep apnea.

Complex sleep apnea: a mixture of both central and obstructive sleep apnea syndromes, the technical definition requires that at least half of the respiratory events are central and that there are at least five central events per hour, often seen with the initiation of CPAP.

Compliance: the degree to which one uses the CPAP; because of Medicare requirements, one is considered compliant with CPAP usage if they use the machine at least four (4) hours per day for seventy percent (70%) of the days during a thirty (30) day period. For Medicare purposes this thirty day period must be within the first ninety days.

CPAP: Continuous Positive Airway Pressure, the most common version of PAP. In its simplest form the pressure is constant, except for the possible use of a ramp to start.

DABSM: a Diplomate of the ABSM, someone certified in sleep medicine by the ABSM.

Delta Sleep: The “deepest” stages of sleep characterized by slow waves called delta waves, the current scoring criteria call delta sleep “N3”.

Desaturation: refers to a drop in the measured blood oxygen level during sleep. Oxygen levels during a sleep study are expressed as a percentage of the maximum carrying capacity (saturation) of the blood. This number should not be confused with a “blood gas” obtained by drawing arterial blood.

DIMS: abbreviation for Difficulty Initiating and Maintaining Sleep, used to group the various forms of insomnia in the very first classification of sleep disorders, now sometimes used as an abbreviation for insomnia.

DME: Durable Medical Equipment company, the usual supplier of PAP machines and supplies.
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DPAP: Demand Positive Airway Pressure, a defunct version of PAP, last heard of in the early 1990's, which tried to quickly increase the pressure to prevent respiratory events. The problem was that the rapid pressure increase would awaken the user.

Dysrhythmia: an abnormal rhythm, used to refer to an abnormal pattern in the ECG or EKG.

ECG or EKG: the Electrocardiogram, the electrical activity of the heart normally recorded from the chest wall, the version using the letter K derives from the original German spelling and, when spoken, is easier to distinguish from EEG.

EDS: abbreviation for Excessive Daytime Somnolence (or Sleepiness), sleepy.

EEG: abbreviation for Electroencephalogram, the “brainwaves”.

EMG: the electromyogram, a recording of the electrical activity from muscles, an indication of the level of muscle tone or tension.

EPAP: Expiratory Positive Airway Pressure, refers to the pressure setting on a bilevel machine during exhalation.

EPR: Expiratory Pressure Relief, a proprietary name used by ResMed a major CPAP manufacturer.

Expiratory relief: a CPAP feature introduced early in this century which provides for a lower pressure during exhalation, it differs from bilevel PAP in that once the pressure is lowered it then returns to baseline gradually and without waiting for inhalation to begin.

Flex: a proprietary name used by Respironics, a major CPAP manufacturer, for their version of expiratory relief.

Headgear: the harness, or occasionally cap, that is used to hold a CPAP mask in place.

Humidifier or Humidification: provides additional moisture to the CPAP air. There are two types of CPAP humidifier, a “cold passover” humidifier which is nothing more than a tank of water and is rarely seen anymore, and a heated humidifier which
is the modern standard. CPAP humidifiers moisturize the air in the CPAP circuit and should not be confused with a common room humidifier.

Hypersomnolence: sleepiness greater than the normally expected level, often abbreviated “EDS”.

Hypertension: high blood pressure.

Hypervigilance: an increased or elevated level of alertness.

Hypnogogic Hallucinations: hallucinations occurring just prior to sleep onset, believed to be a symptom of a transition from wakefulness directly into REM sleep, a condition of being partially awake and partially in REM sleep, commonly associated with narcolepsy.

Hypopnea: a partial apnea. There are two technical definitions of hypopnea: (a) the airflow diminishes to 70% of baseline and the oximetry desaturates 4 percentage points, the Medicare definition; or (b) the airflow diminishes to 50% of baseline and the oximetry desaturates 3 percentage points. In the past there could be an EEG arousal instead of a desaturation, but the subjectivity of scoring arousals resulted in less reliability and the arousal criteria were dropped.

Hypoventilation: breathing too shallow to provide for adequate gas exchange, generally documented by an accumulation of carbon dioxide in the blood, but may also result in a reduction of oxygen in the blood. The most common cause for this in the sleep lab is obesity.

Hypovigilance: a reduced level of alertness.

Inadequate Sleep Hygiene: an insomnia which is caused or exacerbated by a daily routine that is inconsistent with sleep onset, sleep maintenance, and/or sleep quality; examples would include caffeine consumption late in the day, excessive alcohol consumption, napping during the day or just prior to bedtime, insufficient daily activity, exercising just prior to bedtime, and others.

Insomnia: an inability to sleep. Sleep specialists distinguish a number of different diagnoses and patterns of insomnia.
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IPAP: Inspiratory Positive Airway Pressure, refers to the pressure setting during inhalation on a bilevel machine.

K-complex: a specific brainwave pattern indicative of stage N2 sleep.

Macroglossia: a big tongue

Mask: the patient interface for the CPAP system, even though some examples would hardly be recognized as a “mask” by many people. New mask designs are introduced regularly, there are probably 30 or 40 available at any time; there should be one that is comfortable on your face.

Mixed apnea: an apnea which begins as a central apnea and ends as an obstructive apnea. Sometimes this occurs when the apnea sufferer hyperventilates (over breathes) after the apnea, blowing off CO₂, which causes a central apnea but when breathing effort resumes the airway collapses immediately and becomes obstructive. People with this pattern sometimes take longer to adapt to the CPAP.

MSLT: abbreviation for Multiple Sleep Latency Test. The test is used to quantify the level of sleepiness and consists of nap trials at two-hour intervals.

Mucosa: a moist lining tissue, the “skin” of the nose and mouth.

MWT: abbreviation for Maintenance of Wakefulness Test. This test is often used to quantify the level of sleep resistance for the purpose of clearing truckers, pilots, boat captains, etc., for their medical exam.

Narcolepsy: the classic disorder of “sleepiness” is mainly a disorder of sleep regulation. It is caused by an abnormality in the orexin/hypocretin system in the brain and can result in such symptoms as hypnogogic hallucinations, sleep paralysis, and cataplexy.

Nasal Pillows: small cushions the fit just into the nostrils to deliver PAP only into the nose; originally conceived to reduce mask bulk, this type of mask can also result in lower resistance and higher airflow.
NREM or NREM Sleep: all stages of sleep other than REM sleep; further subdivided into stages, now referred to as N1, N2, and N3; accounts for about 75 to 80 percent of the sleep time for a healthy young adult.

Obstructive apnea (or hypopnea): a respiratory event which occurs because of a temporary obstruction of the airway in the area of the pharynx; the event must be a minimum of ten seconds in duration but can be much longer; to be considered an apnea, the airflow must decrease by 90% or more; to be considered an hypopnea, the airflow must decrease by either 30% or 50% with a corresponding decrease in oxygen saturation by 4 or 3 percentage points, respectively.

Obstructive Sleep Apnea Syndrome: a diagnosis indicating a minimum of five obstructive apneas and/or hypopneas per hour of sleep time, but often much worse; it has been associated with daytime sleepiness, memory and concentration difficulty, and with cardiovascular complications such as high blood pressure, heart failure, heart attack, and stroke.

Oximetry, Oximeter: the technology, and the machine, of blood oxygen measurement normally used in a sleep study, consists of a light beam passing through a thin area such as a finger or earlobe, measures the ratio of blood cells with oxygen and blood cells without oxygen, results expressed as a percentage of the total oxygen carrying capacity occupied.

Oxygen Saturation: the percentage of the total oxygen carrying capacity of the blood actually occupied by oxygen.

PAP: Positive Airway Pressure, a generic term for all the various versions of CPAP, Bilevel machines such as “BiPAP” and the specialized versions of “noninvasive ventilation” not considered in this book.

Paradoxical Insomnia: a persistent complaint of insomnia which cannot be objectively substantiated; formerly called “sleep state misperception” the sufferer sleeps by all objective measures, including EEG and observation by others, but complains of being awake most or all of the time period.

Periodic Limb Movements in Sleep (PLMS) or Periodic Limb Movement Disorder (PLMD): regular, rhythmic jerks or kicks of the legs while asleep, specific scoring rules determine which leg movements are counted, often confused with RLS by the general public and, sometimes, even by physicians.
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Pharynx: the connecting tube of soft tissue between the mouth and nasal passages at the upper end and the esophagus and trachea (windpipe) at the lower end, the part of the upper airway that both food and air must pass through; it is in this area that the obstruction occurs in obstructive sleep apnea syndrome.

Pickwickian Syndrome: named because of a character in Charles Dickens' “Pickwick Papers” and referring to the condition of having both obstructive sleep apnea and hypoventilation at the same time, the Pickwickian is significantly obese and typically hypersomnolent.

PSG or Polysomnogram: this is the basis of all sleep studies. It consists of continuous recording of fifteen to twenty channels of physiologic data including EEG, eye movements, chin muscle tension, EKG, leg movements, airflow (using two different detection technologies), chest and abdominal breathing effort, and oximetry. The standard laboratory test must be monitored by a technologist throughout the entire recording period.

Psychophysiological Insomnia: a specific classification of insomnia in which psychological arousal leads to physiological arousal which results in insomnia. Often initially associated with an external stressor, and therefore initially an adjustment insomnia, it becomes particularly challenging when the insomnia itself becomes the stressor which leads to the psychological arousal.

Pulse Ox: the oximeter.

Ramp: a comfort feature added to CPAP machines, allows the machine to start at a lower pressure and gradually increase the pressure to the prescribed level, intended to help the user fall asleep.

RDI: the “respiratory disturbance index”, often the same as the AHI, but some labs included RERAs in the count resulting in a higher value. Medicare and some insurance companies do no recognize RERAs and specify that only the AHI be used to qualify for CPAP.

REM or REM Sleep: Rapid Eye Movement sleep, now called Stage R, the stage in which most dreaming occurs, accounts for about 20 to 25 percent of the sleep time for a healthy young adult; important in the treatment of sleep apnea because the apnea often gets worse during this stage of sleep (the apnea may, however, be unchanged or, more rarely, even better during REM)
RERA: Respiratory Event Related Arousal, an EEG arousal associated with any scorable, or visible but unscorable, respiratory event, the latter case would include those events that would have been scored as hypopneas before the arousal criteria were dropped from the definition.

Respiratory Event: a generic term for any apnea or hypopnea, may be extended to include apparent decreases in airflow that are unscorable by the hypopnea definition because there is not sufficient desaturation.

Restless Legs Syndrome (RLS): a phenomenon that occurs while awake, RLS consists of an irresistible urge to move the legs, interfering with sleep onset; symptoms occur when inactive and may occur at any time during the day but are often worse at night; often confused with PLMS which occurs during sleep and may lead to sleep fragmentation and multiple awakenings.

RPSGT: Registered Polysomnographic Technologist, the premier credential for sleep techs performing and scoring sleep studies.

Saturation: see Oxygen Saturation.

Scoring: the process of analyzing a sleep study, usually performed by a registered technologist (RPSGT), includes the sleep staging, counting of arousals, counting respiratory events, counting leg movements, notation of snoring, body position, movements and any unusual behavior; all of this data must adhere to specific scoring rules; although “computerized scoring” is available on most PSG systems, it is not considered acceptable and human scoring is required for accreditation of a sleep lab.

Shiftwork Sleep Disorder: sleep disturbance, whether manifesting as insomnia or hypersomnia, due to any unusual work schedule, the most obvious being rotating shifts.

Sleep Disordered Breathing (SDB): refers to the entire range of sleep related breathing disorders including apnea, hypopnea, RERA, snoring, UARS, hypoventilation; some labs have been set up only to evaluate, and are accredited only to evaluate, SDB.
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Sleep Hygiene: refers to all the behaviors during the day and evening, and upon retiring to bed, that contribute to or detract from one’s ability to fall asleep and/or stay asleep or obtain sleep of good quality. For example, drinking coffee just before bedtime would normally be considered poor sleep hygiene, whereas listening to soft music and light reading would be considered better sleep hygiene.

Sleep Paralysis: a condition in which a person is unable to move and becomes aware of this condition, thought to be a transition between wakefulness and Stage R (REM) sleep when muscle paralysis is normal, or vice versa; probably indicates a significant disruption of sleep regulation such as narcolepsy or shiftwork, or may indicate sleep deprivation.

Sleep Maintenance Insomnia: difficulty remaining asleep, may manifest as frequent brief awakenings or as more prolonged periods of wakefulness during the desired sleep period, may be abbreviated DMS for “difficulty maintaining sleep”.

Sleep Onset Insomnia: difficulty falling asleep upon retiring, may be abbreviated DIS for “difficulty initiating sleep”.

Sleep Phase Advance: a condition in which the biological clock component of sleep regulation has been shifted to an earlier time resulting in an early sleep onset and early awakening at the end of the sleep period. A common example is an elderly man who falls asleep in the early evening such as 7 pm and then awakens for the day at 3 am, after 8 hours, unable to return to sleep.

Sleep Phase Delay: a condition in which the biological clock component of sleep regulation has been shifted to a later time making it difficult to fall asleep at an earlier time if desired. An example would be a college student who has had only afternoon classes and studied late into the night all school year, which delayed the sleep phase, but then gets a summer job that starts at 5 am and needs to get to sleep early and arise early the next morning.

Sleep Spindle: a particular EEG pattern indicative of N2 sleep, a brief burst of brainwaves in a specific frequency range.

Sleep Stage: based upon the EEG, eye movements, and EMG; sleep is divided into four stages (N1, N2, N3, R).

Slow Wave Sleep: an alternative term for Delta Sleep, now called “N3”.

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Snoring: a rhythmic noise caused by the turbulent airflow and/or tissue vibration in the airway, mostly in the pharyngeal area. Snoring is NOT the same as sleep apnea but the factors contributing to snoring are many of the same factors that contribute to sleep apnea. Most, but not all, sleep apnea sufferers also snore. Many snorers also have sleep apnea.

Split-night: a combination sleep study in which the study is begun without CPAP (the diagnostic part) to document sleep apnea and then CPAP is instituted (the titration part) to determine the optimal CPAP pressure.

Staging: The process of reviewing the PSG to determine the sleep stage; part of the scoring process.

Titration: the incremental adjustment of one parameter to reach a measurable endpoint; in the case of CPAP, this refers to the incremental adjustment of the CPAP pressure to find a pressure that adequately controls the respiratory disturbance, minimizing the AHI preferably to below 5.0.

Turbinates: a fleshy structure in the upper nose; increases the surface area of the nasal mucosa to increase the ability of the nose to warm and humidify the air before it reaches the lungs.

UARS: Upper Airway Resistance Syndrome, used to describe the sleep disturbance caused by airway resistance which does not rise to the level of causing an apnea or hypopnea.
Appendix I: Some Sleep Hygiene Tips

The following tips have been found to work for many people who have trouble sleeping.

Personal habits:

Try to establish a routine where you go to bed and get up at approximately the same time every day. This will help strengthen your biological clock put your body into a good “sleep-wake rhythm”. Of course, this can be difficult or impossible if you are a shiftworker or work an unusual schedule.

Regular exercise can help deepen your sleep. It should be moderate and invigorating but not exhausting (unless you are an athlete in training). However, exercise shortly before bedtime may prevent you from falling asleep.

For several hours before bedtime, avoid alcohol; beverages with caffeine; chocolate; heavy, spicy, sugary or sugar-filled foods; and smoking. They can affect your ability to fall asleep or reach deep sleep.

Limit fluid intake before bedtime to help reduce nighttime urination.

Sleep environment:

If your bedroom is too cold or too hot, it can keep you awake. Find a comfortable temperature setting for sleeping (most people sleep better with a slightly lower room temperature), and keep the room well ventilated.

Block out all distracting noise; a “white noise” source is OK. Eliminate as much light as possible, but total darkness is not necessary. Just enough light to prevent tripping if you need to visit the bathroom is OK.

Bedding that is uncomfortable can prevent restful sleep. This can include too soft or too hard of a mattress, dirty bed linens, too thick or too thin pillow, bedbugs, etc. Evaluate whether or not this is a source of your problem, and make appropriate changes.

Use your bed for sleep and not as an office or recreation room. Don’t watch TV or read for extended periods in bed; a few minutes is OK. Don’t study, pay bills, or other tasks that require concentration in bed. Your brain should “know” that the bed is for sleeping.
Pre-sleep routine:

A regular presleep routine such as a warm bath or a few minutes of reading can help your brain know it’s time to shut down and go to sleep.

Leave your worries about job or family for another time. It may help to have a “worry pad” on your nightstand to write down any last minute thoughts and save them for the next day.

Relaxation techniques before retiring may relieve anxiety and reduce muscle tension.

Get into comfortable sleeping position. If you don’t fall asleep quickly do not allow yourself to get frustrated, this will only arouse you more and make sleep more difficult.

If you find yourself getting frustrated, get up and move to another room with soft lighting and read until you become sleepy.

Some foods such as milk or bananas may help you sleep.

Other Factors:

Physical symptoms associated with several medical conditions are known to inhibit or disrupt sleep. Common examples include arthritis, heartburn, menstruation, headache, hot flashes.

Sleeping difficulties are also associated with psychological factors such as anxiety, depression, and stress. Your sleep doctor can help you determine the problem and the best treatment approach for you.

Many prescription and over-the-counter medications, and dietary supplements, can cause sleeplessness as a side effect. Ask your doctor or pharmacist if this is a possibility with your medications or supplements.

Sleep medications distort the organization of your sleep and treat the symptoms of insomnia without correcting the underlying problem. The result can be less than fully restful sleep and your goal should be to rediscover how to sleep naturally.

These tips will help many individuals but not everyone. If you still have difficulty sleeping after following these suggestions, speak with your sleep doctor.
Appendix II: A screening questionnaire we sometimes use

Sleep Apnea is a very common sleep disorder that can lead to serious health problems. To help decide if you should be evaluated for sleep apnea, answer the following questions.

Group A:
- Do you have or are you being treated for: high blood pressure, congestive heart failure, or an irregular heartbeat?
- Have you ever had: a heart attack, coronary bypass surgery or stent, a stroke, “mini-stroke”, or “TIA”?
- Have you recently gained weight for no apparent reason or have type II diabetes?

Group B:
- Do you snore or have you been told that you snore?
- Do you sleep on several pillows, with your head elevated, or in a recliner?
- Do you wake several times during the night or do you have to go to the bathroom (to urinate) more than once during the night?
- Do you wake up with headaches or have headaches during the night?
- Do you feel “fuzzy headed” or “foggy” when you wake up or do you have a hard time getting going?

Group C:
- Do you feel tired or sleepy or do you lack energy during the day?
- Do you nap or doze off during the day, or in the evening before going to bed, more than once a week?
- Do you have a hard time concentrating or do you have a poor memory?
- Do you drink several caffeinated beverages (coffee, tea, or soft drinks) during the day to help you stay awake or to help you concentrate?
- Are you irritable?

If you answered “yes” to one question in each group, or more than one question in one group, you may have sleep apnea. Discuss the possibility with your doctor.
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Appendix III: The results form we use.

Sleep Study Results for:

The results of your sleep study indicate that you have a sleep disorder called sleep apnea, which means you stopped breathing a number of times during your time asleep. Sleep apnea is defined as stopping breathing five or more times per hour of sleep.

You stopped breathing a total of ______ times in ______ hours ______ minutes of sleep. This averages out to ______ times per hour of sleep. This is considered a mild/moderate/severe level of sleep apnea.

The short-term effect of sleep apnea is a disrupted and unrefreshed sleep, often resulting in fatigue and sleepiness the following day. This may result in an increased risk of accidents and you should exercise extra caution when driving, operating machinery, or doing other potentially dangerous tasks.

The longer-term effects of sleep apnea include high blood pressure, congestive heart failure, and an increased chance of heart attack, stroke, and irregular heart rhythm. Additionally, sleep apnea makes weight loss more difficult and makes it harder for diabetes to control blood sugar.

Sleep apnea usually occurs when your upper airway collapses as you inhale, obstructing your breath, as if you actually "nocked" your throat closed. This is called obstructive sleep apnea. Sometimes sleep apnea occurs when you simply hold your breath in your sleep, a condition called central sleep apnea. The two types of sleep apnea may occur together which is called complex sleep apnea. Both are treated the same but complex sleep apnea is often more difficult to control and sometimes requires additional sleep studies. Your apnea was obstructive/central/complex.

The most consistently effective treatment for sleep apnea is a machine called CPAP, which stands for Continuous Positive Airway Pressure. This machine essentially "blows" the air in your nose and keeps the airway open. By "pushing" the air in, instead of you "pulling" the air in, the throat does not get "nocked" closed. For many people, losing weight will reduce the amount of pressure needed to keep them breathing and for some people with mild sleep apnea, it will solve the problem. An Ear, Nose and Throat doctor may also be able to help either through a reduced pressure need or, sometimes, eating the problem.

We have to determine the pressure needed to keep you breathing. Sometimes we are able to do this on the initial sleep study night, but more often we need a second night to determine this. In your case we need to do a second night. After we have determined your pressure needs, we will order a machine for you from the medical equipment company of your choice. The company personnel will contact you about getting your machine and will show you how to use it and care for it.

There are several important points: (1) There are many masks available. One of them will almost certainly be comfortable for you, but it may take a while to find the best mask for you. Communicate with the equipment company concerning mask comfort issues in the first couple weeks. (2) There are a number of adjustments that can be made on the machine for comfort. If you have any trouble, whatsoever, please let us know. (Examples include: runny nose, stopped up nose, pulling the mask off, and swallowing air.) We probably know how to improve the problem. (3) It will probably take you a while to get used to sleeping with the CPAP. Be patient, give it some time, and let us know if you are having difficulty.

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Appendix IV: About the Author.

Robert Dawkins, PhD, MPH, received his PhD from the University of South Alabama College of Medicine, and his MPH from the University of Alabama at Birmingham School of Public Health. He also holds degrees from Emory University (chemistry) and the University of West Florida (biology). He is certified by the American Board of Sleep Medicine.

He has been responsible for the clinical management of American Academy of Sleep Medicine (AASM) accredited sleep disorders centers since 1987. He is currently the Clinical Director of the sleep center at the West Florida Hospital in Pensacola. For ten years he was a site visitor for the AASM accreditation program and for five of those years he also served on the Accreditation Committee, which oversees the accreditation program and recommends standards to the AASM Board of Directors.

He has trained nine physicians for the sleep medicine board exam and has assisted four others with their preparation.
Appendix V: Acknowledgments.

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