

Have you reached your saturation point yet?

By John R. Goodman BS RRT

Oxygen therapy has come quite a long way since its discovery way back in the late 1700's. Although oxygen had some limited clinical application over the ensuing years, it would be nearly 140 years before oxygen could be manufactured commercially and stored (relatively) safely in large steel cylinders. Even then, oxygen was somewhat tricky to transport and store and as the dawn of the 20th century approached; there was no readily available device to connect the patient to the oxygen other than a bewildering variety of oxygen masks. In the 1920's the oxygen tent was developed and this was one of the primary oxygen delivery devices for the next 30 years or so.



Many types of masks were used in the 1920s and 30s Oxygen tents standard of care for years

The problem with oxygen tents were they were inherently claustrophobic for patients already anxious about their breathing, they got terribly warm after a short while, and there was the ever present danger of a prospective fire in an oxygen enriched environment. This was especially true of children who may have been given a friction toy to play with while they were hospitalized.

If we turn the telescope around and look back on oxygen therapy we can see that there wasn't any real home oxygen therapy industry until there was a need for one to exist. Although it would seem to just make common sense that if oxygen worked on pulmonary patients while in the hospital, it should work equally well in the home. But it wasn't until the invention of the home oxygen concentrator in the 1970's that oxygen for all practical purposes could be safely placed in the home.

The development of the oxygen concentrator and liquid oxygen *did* coincide with the early work of Dr. Tom Petty and his colleagues. So by the end of the 1970's and the beginning of the 1980's the home oxygen industry truly began to develop. Let's remember that in these early days, oxygen as a drug was not as well known

as it is today. Also, there was a true profit motive to get the industry going because at that time a home care company might get as much as \$600.00 per month for *each* oxygen patient on a home concentrator.

These glory days lasted until the mid 1980's when Medicare began to ratchet back its reimbursement coverage criteria for home oxygen. Oxygen therapy has been modality neutral for quite some time now. This means that a home oxygen company is going to get reimbursed the same monthly allowable for each patient no matter what type of oxygen system they are using.

While it is true not everyone who has ever smoked a cigarette goes on to develop COPD, there certainly is more than a casual relationship between the two. Since COPD is an insidious disease that takes many years to develop, the smokers of the 50's, 60's, and 70's are the pulmonary patients of today. Advances in the treatment of all forms of pulmonary disease have made substantial progress over the past 30 years or so. There are a number of invasive procedures that have been proven helpful to COPD patients with certain types of disease. Heck, we do an average of 2,000 lung transplants a year in the United States alone.

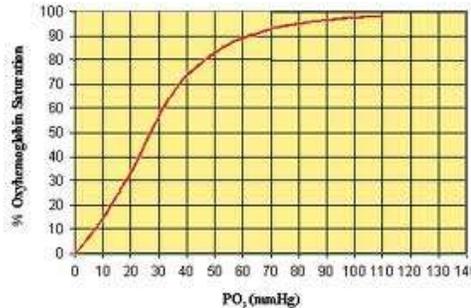
So with all these advances in the treatment of pulmonary disease, there is one thing (actually a number) that hasn't changed during all these years. The number I am referring to is the oxygen saturation percentage (SaO₂) required to prove the need for true 24 hour per day oxygen supplementation.

Another look back through the telescope is required here. The scientific basis for oxygen therapy is based primarily on two major studies published in the early 1980's. These include the NOTT (Nocturnal Oxygen Therapy Trial) study and the BMRC (British Medical Research Council) study. To make a long story short, these two studies showed a very significant survival effect in patients who received oxygen more continuously (24 hours per day) than patients who received oxygen for either 12 or 15 hours per day. These studies were done way before pulse oximetry was readily available, and as such relied on arterial blood gases to determine what oxygen level qualified a patient for home oxygen therapy.

So a valid question to ask might be "Why then do we accept a reading from an oximeter of 88% in lieu of an arterial blood gas?" The answer is quite simple from a pure mathematical point of view.

There is a very famous chart that shows the relationship between the pressure of oxygen from a blood gas (PO₂) and oxygen saturation ...SaO₂.

This chart is called the Oxyhemoglobin Dissociation Curve. If you look at the red line and where the 90% saturation point bisects the PO₂ figure on the horizontal axis, you can see a PO₂ of *about* 55mm equals an oxygen saturation of *about* 88%.



Since arterial blood gases are expensive, can be painful and cause patient discomfort, over a period of time oxygen saturation levels became more and more acceptable, especially as oximeters got more and more reliable. I have called or emailed a number of well respected pulmonologists regarding this standard, and it seems it is quite difficult to put an actual date on exactly when this change occurred.

The main reason I raise this topic is to open up a discussion of the possibility of changing the official oxygen prescription form. In the early days of oxygen therapy it was quite typical to write the order for 2 L/min for all conditions. A far thinking physician of that time might have the patient increase the flow by 1 L/min for increased activity. As more research was done, but more importantly as the technology exploded, patients were offered a bewildering array of oxygen delivery devices. It has become very difficult (if not logistically impossible) for a busy pulmonologist to keep up with all the changes. That's why over the past two years or so there has been a fairly strong movement amongst pulmonologists to change the way oxygen is prescribed.

Here we are just a few months away from the year 2013. It is hard to believe but when the first pulse oximeters for home use were introduced to the market they cost between \$400 and \$500.00. Now anyone who can do a Google search can find a basic oximeter for just a little over \$30.00. At first many pulmonologists were concerned that patients monitoring their own oxygen saturations would lead to a flood of phone calls when a patient's saturation fell a few points and the patient or their caregiver became concerned. This never actually happened, and in fact quite the opposite did happen. Patients began to use their oximeters to "titrate" their oxygen flow rates to keep them in a normal range under most if not all conditions.

My guess is very few if any patients on oxygen have ever seen this form. I have taken the liberty of downloading it and pasting it above. As you can plainly see the physician must fill out each box. These are both time consuming for the physician and of course there is no reimbursement for his/her time. Look closely at the form under section B. There are really only two numbers they are looking for. It is either your PO₂ from the last drawn arterial blood gas, or the most recent oxygen saturation level. A few lines further down it asks the physician to fill in the highest oxygen flow rate in liters per minute. This is the way it has been ever since the beginning of home oxygen therapy, and certainly before the routine use of pulse oximetry by patients themselves. This is the area now under scrutiny by many leading pulmonologists and researchers who actually take care of pulmonary patients day to day.

Putting aside the ever present question about knocking out hypoxic drive for now, today's modern oxygen patient is better educated, better trained, and has more resources to access than ever before. Today's oxygen patient has figured out on their own what oxygen flow rate works best for them under conditions of rest and activity. Many know their oxygen requirements while they sleep as well. Oxygen delivery is a dynamic process, whether we look at it on a breath by breath basis, a minute to minute basis or as it relates to different activities.

We no longer have a "one size fits all" prescription for oxygen therapy. Many more patients today are following Dr. Tom Petty's sage advice to "titrate while they migrate." Patients who understand and follow their oximeters are finding they do not have to simply accept a saturation of around 90% or so as being "alright...or just acceptable." In fact, what is probably needed is a concerted effort among prescribers of oxygen to allow the prescribing physician to specify what oxygen saturation level they want their specific patient to achieve, independent of their delivery device. This would be much more physiologic and allow patients to take even more control over their disease.

This is certainly the right direction in which to move. After all, your red blood cells don't know how many *liters* of oxygen you are on. But they do know when they are well saturated! Don't be afraid to talk to your pulmonologist about the saturation levels you feel are optimal for you and allow you to function best. You may be surprised at how willing they are to talk to you about YOUR normal's. Oxygen is still the only drug ever proven to increase survival. Oxygen in and of itself is *not* life support...but it certainly is *supporting* your life.